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Preface

This is the documentation of the LaTeX template for publications in the series "FAU Studien aus dem Maschinenbau". This guide provides an overview of the changes made to the standard `scrbook` class (on which this class is based on) that are important to the end user.

It also introduces some packages that are automatically loaded by the class. For the packages for acronyms and bibliographies class specific commands have been defined to meet the typographical requirements. A list of all packages loaded by the class can be found under *List of all included packages* on page 33.

This documentation covers only a very small part of the features of LaTeX and the included packages. It is always worth taking a look at the documentation of the individual packages.

A detailed introduction to LaTeX in general can be found at `https://www.overleaf.com/learn/latex/Main_Page`.

Contents

List of Symbols and Abbreviations

List of Abbreviations

Abbreviation	Description
FAU	Friedrich-Alexander-Universät Erlangen-Nürnberg
LaTeX	Lamport TeX

List of Symbols

Symbol	Unit	Description
c_0	$\mathrm{m\,s^{-1}}$	speed of light in vacuum
γ		Lorentz factor

List of Figures

List of Tables

1 Introduction

The class `faupress` implements all format specifications of the FAU University Press. To use this class in its entirety, it **should be compiled with LuaLaTeX**.

To achieve better consistency, some new commands have been defined and some old ones have been redefined. Such commands were marked with *Custom command* in the following documentation.

2 Class options

The class is loaded by the following command:

```
\documentclass[<options>]{faupress}
```

There are several options available that can be passed as key-value pairs. Multiple options are separated by commas. Below you can see the default options and their alternatives.

The `paper` option can be used to change the paper size:

```
paper = 17x24 default
        a5
```

There are two languages available:

```
language = german default
           english
```

Setting the language takes care of the microtypography, changes language specific commands (e.g. `\tableofcontents`) and switches to the correct hyphenation pattern. The `polyglossia` package is used for this. The language that was not selected is still set as a second language. This allows individual sections to be set in the other language. The package provides an environment for this, e.g. for German:

```
Today is \today.
\begin{german}
  Heute ist der \today.
\end{german}
```

Today is August 4, 2020. Heute ist der 4. August 2020.

The list of abbreviations and symbols is generated using the `acro` package. By default, separated lists for abbreviations and symbols are printed. If want only one big list you can use the option `combined`. If you only want one of those lists you can use `onlyabbreviation` and `onlysymbol`.

```
acronym = true default
          combined
          onlyabbreviation
          onlysymnnbol
```

By default the rows of the acronym table are interspersed by horizontal lines and the columns are separated by vertical lines. This behaviour can be changed using the following option:

```
acronymline = both default
              onlyhorizontal
              onlyvertical
              none
```

For more information, see *Acronyms* on page 13.

By default, this class uses the `biblatex` to manage citations. If you do not want to use this feature you can switch it of:

```
bibliography = true default
               none
```

Setting this option to `none` stops `biblatex` and all associated definitions from being loaded. For more information, see *Bibliography* on page 29.

The bibliography consists of three parts, the general bibliography, the one of student's works referring to this work and the one for own publications. If one wants to disable one of these there is the option:

```
bibliographypart = all default
                   none
                   nomain
                   onlymain
                   noown
                   onlyown
                   nostudent
                   onlystudent
```

The options for this documentation are:

```
\documentclass[
  paper = 17x24,
  language = english,
  acronym = true,
  acronymline = onlyhorizontal,
  bibliography = true
  ]{faupress}
```

3 Structure of the document

This chapter gives a brief summary of the commands available to structure the document.

The title pages are created automatically. To display the those its components have to be declared in the preamble of the document. The storing commands for this class can be found under *Storing commands* on page 35 in the Appendix.

3.1 Front page

The front page of this document is generated by the command:

Custom command

```
\maketitle
```

This typesets the first two pages of the document using the information given in the preamble.

3.2 Front matter

After the first two pages the front matter is started by the command:

```
\frontmatter
```

This command switches on page numbering using Roman numerals. The first two pages in the front matter are the title page of the faculty, which are also generated from the storing commands in the preamble by:

Custom command

```
\makefacultytitle
```

The faculty title page is followed by the preface. The preface chapter is started by

Custom command

```
\begin{preface}
\end{preface}
```

This command typesets a unnumbered chapter named “Preface” (German: “Vorwort”). This chapter does not appear in the table of contents, which is automatically generated from the sectioning commands used in the document by the command:

```
\tableofcontents
```

The table of contents for this document can be found on v. The first chapter of the front matter to appear in the table of contents is the List of Symbols and Abbreviations (German: “Formelzeichen- und Abkürzungsverzeichnis”). With the help of the `acro` package the list can be generated automatically:

Custom command

```
\faupressprintacronyms
```

For more information, see *Acronyms* on page 13.

The front matter is completed by lists of figures and of tables:

```
\listoffigures
\listoftables
```

Both can be found on pages ix and xi respectively.

3.3 Main matter

The main matter is started by the command:

```
\mainmatter
```

Here, the page numbering is reset and displayed with Arabic numerals.

The first chapter in the main part of the document is “Introduction” (German: “Einleitung”) and is typeset by:

Custom command

```
\begin{introduction}
\end{introduction}
```

All chapters & sections in the main matter are numbered and appear in the table of contents. This is done using the standard LaTeX commands:

```
\chapter{<text>}
\section{<text>}
\subsection{<text>}
\subsubsection{<text>}
```

The body ends with the chapters “Summary and outlook” and “Zusammenfassung und Ausblick”:

```
\chapter{Zusammenfassung und Ausblick}
\chapter{Summary and outlook}
```

3.3.1 Short titles

For long chapter & section headings it is recommended to use a short title. All sectioning commands have an optional argument to set a short title.

```
\chapter[<short title>]{<long title>}
\section[<short title>]{<long title>}
\subsection[<short title>]{<long title>}
\subsubsection[<short title>]{<long title>}
```

The short title is what appears in the table of contents and in the headline. It should be used to avoid two-line headlines.

3.4 Appendix & Bibliography

The chapter "Appendix" (German: "Anhang") is typeset using the command:

Custom command

```
\appendix
```

This chapter is unnumbered and appears in the table of contents. The `\chapter` command does not exist in the appendix. The normal sectioning commands work the same in the appendix. Only sections appear in the table of contents and are numbered with letters, all other sectioning commands do not appear in the table of contents and are numbered. It also automatically reduces the fontsize in the table of contents.

```
\section{<text>}
\subsection{<text>}
\subsubsection{<text>}
```

The document is completed by the backmatter:

```
\backmatter
```

In the backmatter the \chapter command is reintroduced and the fontsize in the table of contents is small than for the main part. It contains the bibliography:

Custom command

```
\faupressprintbibliography
```

This command creates a general bibliography, a list of own publications, and a list of students' theses referring to this work. For more information see *Bibliography* on page 29.

4 Acronyms

To typeset acronyms the package `acro`[1] is automatically loaded by the class.

Acronyms are defined in the file `acronyms.tex` (the class will automatically load this file). The basic syntax to define an acronym is:

```
\DeclareAcronym{<label>}{
  short = <acronym>,
  long  = <text>
}
```

These acronyms can be called in the body of the document using the command:

```
\ac{<label>}
```

At the first appearance, this commands prints the long form of the acronym followed by the short form in parentheses. After this, each time `\ac{<label>}` is used only the short form is printed. There are many variations (capitalization, plural forms, only short form, only long form) of this command, which can be found in the official documentation.

To define formula symbols you need to supply extra information. Here, the basic syntax is:

```
\DeclareAcronym{<label>}{
  short = \ensuremath{<symbol>},
  sort  = <sort-key>,
  long  = <text>,
  extra = <unit>,
  class = {formula}
}
```

[1] https://ctan.org/pkg/acro

For math symbols, \ensuremath should be used so that the acronym can be used in text and math environments without problems. As <sort-key> a word must be given. This word is used in the list of acronyms for sorting. For the formula symbol to appear in the correct list, it must be assigned to the formula class.

To display lists of all declared acronyms and symbols use:

Custom command

```
\faupressprintacronyms[<options>]
```

You can pass the same optional parameters to this command as you would pass them to \printacronyms from the original package.

The \faupressprintacronyms command typesets a chapter called "List of Symbols and Abbreviations" (German: "Formelzeichen- und Abkürzungsverzeichnis"). In this chapter a list of abbreviations (German: "Abkürzungsverzeichnis") and a list of symbols (German: "Formelverzeichnis") are created separately. Both lists can be combined to one by setting the class option acronym to combined. If you only want one of those lists you can set acronym to onlyabbreviation and onlysymbol.

Furthermore, the fixed label faupressacronyms is given to the chapter for referencing.

The acronym functionality can be switched off completely via the class option noacro. This option prevents the class from loading the acro packages and from defining associated commands.

4.1 Examples

We define text acronyms in `acronyms.tex` as follows:

acronym.tex

```
\DeclareAcronym{fau}{
  short = FAU,
  long  = Friedrich-Alexander-Universät
          Erlangen-Nürnberg
}
\DeclareAcronym{latex}{
  short = \LaTeX,
  long  =  Lamport \TeX
}
```

Now we can use the acronyms in the main text:

```
\ac{fau} was founded in 1742. Only 242 years
after the foundation of \ac{fau}, \ac{latex}
was first published.
```

FAU was founded in 1742. Only 242 years after the foundation of FAU, Lamport TEX (LATEX) was first published.

We already used `faupressprintacronyms` at the beginning of the document. The list of acronyms can be found on page vii. On the same page you can only see the list of symbols. In both lists, all acronyms that were defined are always displayed, regardless of whether they were used in the main text or not.

Formula symbols are defined as follows:

acronym.tex

```
\DeclareAcronym{c0}{
  short = \ensuremath{c_0},
  sort = {c},
  long = speed of light in vacuum,
  extra = \si{\meter\per\second},
  class = {formula}
}
\DeclareAcronym{gamma}{
  short = \ensuremath{\gamma},
  sort = {gamma},
  long = Lorentz factor,
  class = {formula}
}
```

Here, we typeset the units with help of the `siunitx` package (see *Units* on page 26). Since `\ensuremath` was used, these acronyms can be used in both text and math mode:

```
The \ac{c0} is needed to define the \ac{gamma}:
\begin{equation}
  \acs{gamma} = \frac1{\sqrt{1 -
      \left(\frac{v}{\acs{c0}}\right)}^2}
\end{equation}
```

The speed of light in vacuum (c_0) is needed to define the Lorentz factor (γ):

$$\gamma = \frac{1}{\sqrt{1 - \left(\frac{v}{c_0}\right)}^2} \tag{1}$$

It is advisable to use only the short forms of the acronym in math mode. To ensure this, we use the command `\acs`.[2]

[2] See `acro` documentation: `https://ctan.org/pkg/acro`

5 Figures & tables

Figures and tables are placed inside so called floats. These are containers for things in a document that cannot be broken over a page. They automatically take care of the placement of graphics and tables in the text and format the caption. To create a figure that floats, use:

```
\begin{figure}[<placement>]
\end{figure}
```

In an analogous manner, floating tables is created by:

```
\begin{table}[<placement>]
\end{table}
```

The captions are set inside those floats by:

```
\caption{<text>}
```

This command is only available in float environments and should be placed **above tables** and **below figures**. It is also possible to refer to floats in the text, for more on this see *Labels and cross-referencing* on page 23.

5.1 Figures

The `graphicx`[1] package allows the integration of images into LaTeX documents. This package is automatically loaded by the class.

The most important command of this package is:

```
\includegraphics[<options>]{<image path>}
```

[1] https://ctan.org/pkg/graphicx

The <image path> can be given as an absolute path or relative to the directory where the .tex file is located. The options allow you to scale, rotate and crop images. All options can be found in the documentation.[2]

Here you can see an example of a full figure:

```
\begin{figure}
  \centering
  \includegraphics[width=0.5\textwidth]
    {figures/lines.jpg}
  \caption{This is a figure.}
\end{figure}
```

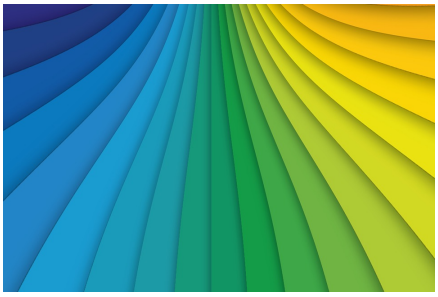

Figure 1: This is a figure.

The image is scaled to half the text width using the width option. An entry was also automatically created in the *List of Symbols and Abbreviations* on page ix.

If there is a dedicated image folder it can be specified with the \graphicspath command in the preamble. The default for this class is:

```
\graphicspath{
  {./graphics/},
  {./figures/}
}
```

[2] https://ctan.org/pkg/graphicx

5.2 Tables

The `tabular` environment can be used to typeset tables with optional horizontal and vertical lines. LaTeX determines the width of the columns automatically.

```
\begin{tabular}{| r | c | l |}
  \hline
  This & is a      & table!          \\\hline
  This & table has & three columns. \\
  \hline
\end{tabular}
```

This	is a	table!
This	table has	three columns.

The number of columns does not need to be specified as it is inferred by looking at the number of arguments provided. It is also possible to add vertical lines between the columns here. The following symbols are available to describe the table columns:

`l` – left-justified column

`c` – centered column

`r` – right-justified column

`p{<width>}` – paragraph column with fixed width

`|` – vertical line

`||` – double vertical line

Three additional column types are defined by this class:

`L{<width>}` – left-justified column with fixed width

`C{<width>}` – centered column with fixed width

`R{<width>}` – right-justified column with fixed width

There is a variety of packages available to extend the table functionality of LaTeX. The following packages are automatically included by the class:

`booktabs` – Enhances the quality of tables in LaTeX.[3]

`array` – An extended implementation of the array and tabular environments which extends the options for column formats, and provides "programmable" format specifications.[4]

`longtable` – Allows you to write tables that continue to the next page.[5]

[3] `https://ctan.org/pkg/booktabs`

[4] `https://ctan.org/pkg/array`

[5] `https://ctan.org/pkg/longtable`

5.2.1 Example

This section shows a somewhat more involved example that uses functionality from the packages mentioned above.

```
\begin{table}
  \centering
  \caption{This is a table.}
  \begin{tabular}{>{\bfseries}r l}
    \toprule
            & Last modified \\\midrule
       Day & \the\day   \\
     Month & \the\month \\
      Year & \the\year  \\
    \bottomrule
  \end{tabular}
\end{table}
```

Table 1: This is a table.

	Last modified
Day	4
Month	8
Year	2020

The `array` package allows you to prefix a column using the > operator. This is used in this example to typeset the first column in bold font. The commands `\toprule`, `\midrule`, and `\bottomrule` are provided by the `booktabs` package. These commands draw horizontal lines with adjusted spacing.

The commands `\the\day`, `\the\month`, and `\the\year` are standard TEX commands. They print out the day, month, and year of the day the underlying `.tex` document was compiled.

6 Labels and cross-referencing

In LaTeX, we can label entities that are numbered (sections, floats, formulas, etc.), and then use that label to refer to them elsewhere.

```
\label{<marker>}
```

The marker can be seen as a name that we give to the object that we want to reference. It is important to add fter a numbered element, otherwise the label will not "latch on".

The number assigned to the object labeled by `<marker>` is printed by the command:

```
\ref{<marker>}
```

The page number of the labeled object is printed using:

```
\pageref{<marker>}
```

The package `hyperref`[1], which is loaded by the class, provides the commands:

```
\autoref{<marker>}
\nameref{<marker>}
```

`\autoref` prints the name of the object the `<marker>` refers to in front of the number, e.g. "Figure 1". `\nameref` prints the title of the object it refers to, e.g. "Labels and cross-referencing" for the current chapter.

Apart from providing these commands, all cross-referenced elements become hyperlinked by importing the `hyperref` package. In addition, the hyperref package also provides commands to typeset web links.

[1] `https://ctan.org/pkg/hyperref`

6.1 Example

First, we need to add a label to our example from page 18. The `\label` command has to always be placed below the `\caption` command:

```
\begin{figure}
  \centering
  \includegraphics[width=0.5\textwidth]
  {figures/lines.jpg}
  \caption{This is a figure.}
  \label{example-figure}
\end{figure}
```

We also add a label to the chapter about figures and tables:

```
\chapter{Figures \& tables}
\label{figures-and-tables}
```

Now, we can use these markers to refer to objects we labeled:

```
\autoref{example-figure} is on
page~\pageref{example-figure} in
the chapter \nameref{figures-and-tables}.
```

Figure 1 is on page 18 in the chapter Figures & tables.

7 Math

This class automatically includes the `mathtools`[1] package and the packages of the American Mathematical Society (`amsmath`[2], `amsfonts`[3], `assume`).

To typeset mathematical expressions as part of the text, the inline mode is used as you can see in this example:

```
This \(V - E + F = 2\) is an inline equation.
```

This $V - E + F = 2$ is an inline equation.

Expressions, which are not part of the text directly, are typeset in display mode. For numbered equations there is the `equation` environment, which puts the expression on separate lines:

```
This is a numbered equation
\begin{equation}
  R_{\mu\nu} - \frac12 g_{\mu\nu} R
    = \frac{8\pi G}{{c_0}^4}T_{\mu\nu}.
\end{equation}
```

This is a numbered equation

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = \frac{8\pi G}{{c_0}^4} T_{\mu\nu}. \tag{2}$$

[1] https://www.ctan.org/pkg/mathtools

[2] https://www.ctan.org/pkg/amsmath

[3] https://www.ctan.org/pkg/amsfonts

For unnumbered equations in display mode there is a starred version of the `equation*`. The short form for this is `\[ \]`:

```
This is unnumbered equation
\[
  i \hbar \frac\partial{\partial t}
    \Psi = \hat H \Psi.
\]
```

This is unnumbered equation

$$i\hbar\frac{\partial}{\partial t}\Psi = \hat{H}\Psi.$$

This class loads the `unicode-math` packages, which supplies the following commands for formatting math:

```
\( \symbf{AaBb\nabla\alpha\beta\gamma} \)    \\
\( \symrm{AaBb\nabla\alpha\beta\gamma} \)    \\
\( \symfrak{AaBb\nabla\alpha\beta\gamma} \) \\
\( \symbfit{AaBb\nabla\alpha\beta\gamma}\)   \\
\dots
```

$\mathbf{AaBb\nabla\alpha\beta\gamma}$
AaBb∇αβγ
$\mathfrak{AaBb}\nabla\alpha\beta\gamma$
$\mathbf{AaBb}\nabla\boldsymbol{\alpha\beta\gamma}$
...

Other formatting commands might not work, because of the used fonts.

7.1 Units

The `siunitx`[4] package offers sophisticated features to typeset units and numbers. Only the basic functions are shown here, but it is worth taking a look at the documentation.

[4] `https://ctan.org/pkg/siunitx`

The packages offers two commands to typesets units: \si and \SI. The first one only prints the unit. The second one has two arguments and typeset unit in combination with a number:

```
\SI{1}{\meter} are \SI{100}{\cm} and lots
of \si{\micro\meter}.

The \acl{c0} is
\SI{299 792 458}{\metre\per\second}.
```

1 m are 100 cm and lots of µm.
The speed of light in vacuum is 299 792 458 m s^{-1}.

As a unit you can either use normal text or predefined unit macros, which are available for all common units.

`siunitx` makes it easy to print quantities with uncertainties:

```
This document has \SI{40 +- 5}{pages}.
```

This document has 40(5) pages.

How the uncertainty is displayed in detail can be controlled via `\sisetup` (There are innumerable other options). The default for this class is:

```
\sisetup{
  separate-uncertainty = true,
  round-mode = places,
  round-precision = 3,
}
```

As you can see, the package also takes care of rounding units.

8 Bibliography

Important:

The custom bibliography commands only work with Biber 2.14 (BibLaTeX 3.14) or newer. Additionally, due to the implementation of the custom commands, the command `\nocite{}` cannot be used.

To write and manage bibliographies, this class loads the `biblatex`[1] package. This package loads bibliographic information form `.bib` files and makes it available for citations in the document. For this class there are three **fixed** `.bib` files in the folder "references":

`bibliography.tex` – for general literature you cite in your thesis

`bibliography-own.tex` – for own publications referring to this work

`bibliography-student.tex` – for students' theses referring to this work

A typical entry in such a file looks like this:

bibliography.bib

```
@book{lamport1994latex,
  title={\LaTeX: a document preparation
    system: user's guide and reference manual},
  author={Lamport, Leslie},
  year={1994},
  publisher={Addison-Wesley},
  edition={2}
}
```

It begins with the type of source and is followed by a keyword, which is later used for citing the entry. This keyword is followed by the bibliographic information. All fields for this can be found in the documentation. While one can edit these `.bib` files per hand, it is easier to use reference management software. Almost all of those programs can export their library to .bib files.

In the text a source can then be cited using the `\cite` command:

[1] https://ctan.org/pkg/biblatex

```
The first edition of Leslie Lamport's book
was published in 1985 \cite{lamport1994latex}.
```

The first edition of Leslie Lamport's book was published in 1985 [**lamport1994latex**].

The bibliography is constructed by:

Custom command

```
\faupressprintbibliography
```

At first this commands prints all sources cited in the document from the file `bibliography.bib`. After this, it prints all sources contained in `bibliography-own.tex` under the title “Own publications referring to this work” (German: “Verzeichnis promotionsbezogener, eigener Publikationen”) and all sources in `bibliography-student.tex` with the title “Students’ theses referring to this work” (German: “Verzeichnis promotionsbezogener, studentischer Arbeiten”). In the last two cases, all file entries are always printed, regardless of whether they were referenced in the document or not.

To generate a bibliography the program `biber` is used, which performs all sorting, label generation (and a lot more). In most LaTeX environments you can specify that `biber` is executed directly when compiling.

If you compile the file using the command line, the compilation process would look like this:

```
lualatex phd_thesis.tex
biber phd_thesis
lualatex phd_thesis.tex
lualatex phd_thesis.tex
```

LuaLaTeX has to be executed twice at the end, so that all references are correct.

9 List of all included packages

The list is still missing!

Appendix

Storing commands

The storing commands needed for this class can be seen below. This code is used exactly like this in the preamble of this document:

Custom command

```
\firstname{FAU}
\lastname{University Press}
\yearofpublication{2020}
\degree{M.Sc.}
\origin{Erlangen}
\title{Documentation}
\subtitle{For the LaTeX template}
\institute{University Library of
  Erlangen-Nürnberg}
\supervisor{Supervisor}
\series{FAU Studien aus dem Maschinenbau}
\volume{XXX}
\doi{10.25593/978-3-96147-XXX-X}
\isbn{978-3-96147-XXX-X}
\eisbn{978-3-96147-XXX-X}
\issn{2625-9974}
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