



MASARYKOVA UNIVERZITA  
PŘÍRODOVĚDECKÁ FAKULTA  
DEPARTMENT OF COMPUTER GRAPHICS AND DESIGN

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# ***A fithesis3* user guide** **for the Faculty of Science**

Bakalářská práce

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Vedoucí práce: Doc. RNDr. Petr Sojka, Ph.D.

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# **Abstrakt**

Fithesis3 is a L<sup>A</sup>T<sub>E</sub>X document class, which streamlines the typesetting of the mandatory parts of theses, so that the author can focus at content alone. Fithesis3 can be used to write theses in various languages across the faculties of the Masaryk University.

This document describes the installation of the fithesis3 class, its configuration and its use at the Faculty of Science. As a demonstration of its capabilities, this document was typeset using the fithesis3 class.

# **Abstract**

Fithesis3 is a L<sup>A</sup>T<sub>E</sub>X document class, which streamlines the typesetting of the mandatory parts of theses, so that the author can focus at content alone. Fithesis3 can be used to write theses in various languages across the faculties of the Masaryk University.

This document describes the installation of the fithesis3 class, its configuration and its use at the Faculty of Science. As a demonstration of its capabilities, this document was typeset using the fithesis3 class.



## **Prohlášení**

Prohlašuji, že jsem svoji bakalářskou práci vypracoval samostatně s využitím informačních zdrojů, které jsou v práci citovány.

Vít Novotný





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# 1 Introduction

To use the `fithesis3` class, you can use an online  $\text{\LaTeX}$  editor, such as Overleaf<sup>1</sup>, which allows you to skip the installation described in Section 1.1 completely.

Another way to avoid installation is to use the faculty  $\text{\TeX}$  Live installation by connecting to the Linux server at `▼yoda.math.muni.cz` or `▲vader.math.muni.cz` over SSH (through port 22222) or over the remote desktop protocol<sup>2</sup> (through port 13556), or to use any public-access computer at the Faculty of Science that runs Linux. If you choose this approach, you can also skip this entire section, although a certain degree of proficiency in working with a Unix operating system is required compared to the first method.

## 1.1 Installation

### 1.1.1 Installing a $\text{\TeX}$ distribution

If you decided not to use a public  $\text{\TeX}$  distribution, you will need to install one locally before proceeding further. A  $\text{\TeX}$  distribution contains tools and packages that are going to help you with preparing and typesetting your  $\text{\LaTeX}$  documents.

The two major  $\text{\TeX}$  distributions that you can install are  $\text{\MikTeX}$ <sup>3</sup>, which can be used with the Microsoft Windows operating system, and  $\text{\TeX}$  Live<sup>4</sup>, which can be installed on both Unix and Windows operating systems. The advantages of  $\text{\MikTeX}$  include refined graphical user interface and the ability to install new packages on the fly.

Along with  $\text{\MikTeX}$ , you will also need to install a Perl interpreter, such as Strawberry Perl<sup>5</sup>.  $\text{\TeX}$  Live installs a Perl interpreter by default.

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1. Overleaf `fithesis3` templates are located at <http://www.overleaf.com/gallery/tagged/muni>.

2. For more information about connecting through the remote desktop protocol, see <http://www.math.muni.cz/aktuality/347-vzdaleny-pristup-yoda-vader.html>.

3.  $\text{\MikTeX}$  can be acquired from <http://miktex.org/2.9/setup>.

4.  $\text{\TeX}$  Live can be acquired from <http://www.tug.org/texlive>.

5. Strawberry Perl can be downloaded from <http://strawberryperl.com/>.

### 1.1.2 Installing packages

In order to function properly, fithesis3 needs the following packages to be installed in your T<sub>E</sub>X distribution: keyval, etoolbox, ifxetex, ifluatex, inputenc, xcolor, graphix, pdfpages, hyperref, microtype, tikz, changepage, fontspec, unicode-math, mathpazo, tex-gyre-pagella, lm, cmap, fontenc, tabularx, tabu, booktabs, csquotes, fithesis.

If you performed a full installation of T<sub>E</sub>X Live, you should already have all the required packages installed. If you are using a partial installation of T<sub>E</sub>X Live, you can use the tlmgr command-line tool by executing `tlmgr install <pkgname>`, where `<pkgname>` is the name of the package you wish to install. In some cases, T<sub>E</sub>X Live may assign a different name to a package. To find out the T<sub>E</sub>X Live name of a package, open the <http://www.ctan.org/pkg/<pkgname>> webpage in a web browser. It should contain the following text:

Contained in T<sub>E</sub>X Live as `<texlivename>`

where `<texlivename>` corresponds to the T<sub>E</sub>X Live name of the package. Use this name instead of `<pkgname>` with tlmgr. Alternatively, you can download the packages manually from <http://www.ctan.org/pkg/<pkgname>> and extract them into the `texmf/` directory located in your user home directory. Mind that the packages themselves may depend on other packages; if you are using a partial installation of T<sub>E</sub>X Live, you will have to resolve these dependencies manually by inspecting the documentation of each package.

If you use MikT<sub>E</sub>X and you enabled the *over the air installation of packages* during the installation, MikT<sub>E</sub>X will automatically download all the required packages, when you first typeset a fibeamer document. If you didn't enable this feature, you will need to enter the MikT<sub>E</sub>X package manager by running

Start » MikT<sub>E</sub>X » MikT<sub>E</sub>X Package Manager (Admin)

and download the packages manually through the user interface. In some cases, MikT<sub>E</sub>X may assign a different name to a package. To find out the MikT<sub>E</sub>X name of a package, open the <http://www.ctan.org/pkg/<pkgname>> webpage in a web browser, where `<pkgname>` is the name of the package you wish to install. It should contain the following text:

Contained in MikTeX as  $\langle miktexname \rangle$

where  $\langle miktexname \rangle$  corresponds to the MikTeX name of the package. If you still can't find the package, try synchronizing the package database by selecting

Repository » Synchronize

from the menu bar of the MikTeX package manager. Mind that the packages themselves may depend on other packages; if you disabled the over the air installation of packages, you will have to resolve these dependencies manually by inspecting the documentation of each package.

If you wish to use a newer version of fithesis3 than the one that is available in your TeX distribution, you should download a file named `fithesis.tds.zip` containing the version of the package you wish to use and place it in a root directory that is recognized by your TeX distribution. In TeX Live<sup>6</sup>, one of such directories is the `texmf/` folder in your user home directory. In MikTeX<sup>7</sup>, the list of recognized root directories can be gleaned by running

Start » MikTeX » MikTeX Options (Admin) » Roots

## 1.2 Picking a TeX engine

There are several programs, called TeX engines, that you can use to typeset fithesis3 L<sup>A</sup>TeX source files into displayable PDF documents. The ones we will discuss are pdfTeX and LuaTeX.

PdfTeX is the more conservative choice and most TeX editors use pdfTeX as the default TeX engine. The main advantage LuaTeX over pdfTeX for a fithesis3 user is the ability to use standard OpenType and TrueType fonts installed on your system, whereas pdfTeX is confined to the fonts installed in your TeX distribution.

If the ability to use arbitrary fonts within your documents interests you, Chapter 3 of the fontspec package manual<sup>8</sup> should provide you

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6. For more information about the TeX Live root directories, see <http://www.tug.org/texlive/doc/texlive-en/texlive-en.html#x1-110002.3>, Chapter 2.3.

7. For more information about the TeX Live root directories, see <http://docs.miktex.org/manual/localadditions.html>.


8. The fontspec package manual is available at <http://mirrors.ctan.org/macros/latex/contrib/fontspec/fontspec.pdf>.

with the relevant information. If you are only going to use the fonts present in the  $\text{\TeX}$  distribution or if you do not intend to change the preset fithesis3 fonts at all, you can safely use pdf $\text{\TeX}$ , which is currently also considerably faster than Lua $\text{\TeX}$ .

### 1.3 Creating and typesetting a fithesis3 document

Before using the fithesis3 class, it is useful to be familiar with the  $\text{\LaTeX}$  typesetting system. A good way to get started is to read one of the introductory texts in English [1–4] or in Czech [5, 6]. Taking one of the *FI:PB029*, *PřF:M5751*, or *FF:PLIN028* courses taught at the Masaryk University is also helpful.

To become familiar with fithesis3, you are encouraged to inspect the example documents `sci-pdflatex.pdf` and `sci-lualatex.pdf` as well as their  $\text{\LaTeX}$  source files that are named `sci-pdflatex.tex` and `sci-lualatex.tex`. The example documents are distributed along with the package inside the `example/` directory<sup>9</sup>. By modifying and by typesetting these  $\text{\LaTeX}$  source files using either the pdf $\text{\TeX}$  or the Lua $\text{\TeX}$  engine, you can quickly gain a working knowledge of  $\text{\LaTeX}$  and use these source files as the basis for your thesis.

If you are using an online editor, such as Overleaf<sup>10</sup>,  $\text{\LaTeX}$  source files will be typeset automatically, as you edit them. The  $\text{\TeX}$  engine can be selected inside the project settings.

If you are using a graphical  $\text{\TeX}$  editor, such as  $\text{\TeX}$ works<sup>11</sup>, you can typeset a  $\text{\LaTeX}$  source file by opening the source file from within the editor and running either the pdf $\text{\LaTeX}$  or Lua $\text{\LaTeX}$  (depending on your choice of  $\text{\TeX}$  engine) command from the task bar. The command needs to be executed at least twice to produce the table of contents, the list of tables, and the list of figures. Additional commands for the typesetting of the bibliography and the index are described in the example documents.

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9. The example fithesis3 documents are also available online at <http://mirror.ctan.org/macros/latex/contrib/fithesis/example/mu>. To typeset the example documents, you need to download the `example.bib` file as well, as it contains the bibliography database used in the examples.

10. Overleaf fithesis3 templates are located at <http://www.overleaf.com/gallery/tagged/muni>.

11.  $\text{\TeX}$ works can be downloaded from <http://www.tug.org/texworks/>.



If you are using the command line, you can typeset  $\text{\LaTeX}$  source files by running either `pdflatex name.tex` or `lualatex name.tex` (depending on your choice of  $\text{\TeX}$  engine), where *name.tex* corresponds to the name of a  $\text{\LaTeX}$  source file. In the case of the two aforementioned example files, the corresponding commands would be:

```
pdflatex sci-pdflatex.tex
lualatex sci-lualatex.tex
```

The command needs to be executed from within the directory, where the  $\text{\LaTeX}$  source file is located. In Windows, the command line can be opened in a directory by holding down the `Shift` key and by clicking the right mouse button while hovering the cursor over a directory. Select the `Open Command Window Here` option in the context menu that opens shortly afterwards. The command also needs to be executed at least twice.

Beside Overleaf and  $\text{\TeX}$ works, any text editor can be used to modify  $\text{\LaTeX}$  source files. However, it is important to ensure that the text editor saves the  $\text{\LaTeX}$  source files in the UTF-8 text encoding. A  $\text{\LaTeX}$  file saved in a different text encoding is likely to be either impossible to typeset or to produce unexpected output.



## 2 Configuration

This chapter provides a full list of the settings that can be used to set up and customize the fithesis3 class.

### 2.1 Setting the class options

At the beginning of a fithesis3 L<sup>A</sup>T<sub>E</sub>X source file, the command

```
\documentclass[option1, option2, ..., optionN]{fithesis3}
```

is used. The following list summarizes the options that are supported by the fithesis3 class and their meaning. Options that are enabled by default are *set in italics*.

**digital** This option sets the options that are the default for the digital version of a thesis. These options are *set in red*.

**printed** This option sets the options that are the default for the printed version of a thesis. These options are *set in blue*.

**10pt, 11pt, 12pt** These options set the font size of the main text to either 10 pt, 11 pt, or 12 pt, respectively. Using the 12 pt font size with the preset fonts should result in the optimal line width of approximately 66 characters in one-column typesetting. With two-column typesetting, the 10 pt font size is a better choice, yielding approximately the optimal 45 characters per line.

**oneside** This option enables one-sided typesetting. One-sided typesetting and printing is generally discouraged. Use only if you don't have access to a double-sided printer, or if one-sided typesetting is a formal requirement at your faculty.

**twoside** This option enables double-sided typesetting. Double-sided typesetting is generally regarded as more visually pleasing and double-sided printing consumes less paper. Use at least 120 grams per square meter paper to prevent show-through.

**onecolumn** This option causes the main text of the thesis to be set in one column.

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**twocolumn** This option causes the main text of the thesis to be set in two columns. The two-column format is unconventional in theses; you should consult its use with your thesis advisor. If you decide to use the two-column format, remember that you also need to change the font size option (**10pt**, **11pt**, **12pt**).

**draft** This option replaces any images with blank rectangles and marks all overfull lines with black boxes. Other packages that you use may behave differently<sup>1</sup> with the **draft** option specified. This can be useful, if you are going to print and proofread a draft of your document.

**final** Unlike the **draft** option, this option typesets the release version of the document.

**palatino** This option sets the roman text font family and the mathematical font family to Palatino.

**nopalatino** This option prevents fithesis3 from setting up the fonts. The user must set the fonts manually in the preamble of the document.

If you are typesetting your thesis on a public-access computer at the Faculty of Science that runs Linux or on either the ▼yoda.math.muni.cz or ▲vader.math.muni.cz Linux server, you can also use the commercial Math Time mathematical font family, which goes well with the T<sub>E</sub>X Gyre Termes text font family. To use Math Time and T<sub>E</sub>X Gyre Termes within your thesis, the preamble of your document should look as follows:

```
\documentclass[nopalatino, ...]{fithesis3}
\usepackage{cmap}
\usepackage[T1]{fontenc}
\usepackage{tgtermes}
\usepackage{mathtime}
%% Here goes the rest of the document.
```

---

1. For more information about the effects of the draft option on various packages, see <http://tex.stackexchange.com/a/49369/70941>.

**color** This option enables the use of colors. A colorful version of the document is more visually pleasing, but shouldn't be used in a printed version, if you don't have access to a color printer. Unless you have a compelling reason not to, always use this option in the electronic version that you are going to publish online.

**monochrome** This option disables colors. Disabling colors is generally discouraged, unless you don't have access to a color printer. However, due to the prevalence of monochrome printing, this option is the default.

**microtype** This option sets up microtypographic extensions<sup>2</sup>, which results in visually more pleasing paragraphs of text.

**nomicrotype** This option prevents fithesis3 from setting up microtypographic extensions.

**table** This option redefines some of the L<sup>A</sup>T<sub>E</sub>X table environments (tabular, tabularx, and tabu) to use alternating colors for odd and even rows. This option only works, if the **color** option is enabled.

**oldtable** This option instructs the style not to redefine any table environments.

**lot** This option causes the list of tables to be included in the front matter of the thesis.

**nolet** This option removes the list of tables from the front matter of the thesis.

**lof** This option causes the list of figures to be included in the front matter of the thesis.

**nolet** This option removes the list of figures from the front matter of the thesis.

---

2. For more information about the T<sub>E</sub>X engine microtypographic extensions, see <http://mirrors.ctan.org/macros/latex/contrib/microtype/microtype.pdf>.

**cover** This option instructs the class to typeset the cover of the thesis on the first pages of the resulting document. A cover should be generally present in the electronic version of the document for completeness. The cover should not appear inside the printed document and should only serve as a template for the text imprinted on the front cover of the thesis cover.

**nocover** This option forbids the typesetting of the thesis cover. Use, if you are typesetting the printed version of a thesis and you are not going to have a cover made for your thesis.

### 2.2 Filling out the metadata

Beside the class options, you can also fill out information about your thesis by inserting the command

```
\thesissetup{
  key1 = {value1},
  key2 = {value2},
  ...
  keyN = {valueN},
}
```

into the preamble of your thesis. The following list summarizes the keys and values that are recognized by the `fithesis3` class and are meaningful for the Faculty of Science.

**title** This key can be used to specify the title of the thesis. The value will be stored as one of the properties of the output PDF file; do not use any  $\LaTeX$  formatting commands within the value.

**TeXtitle** This key can be used to specify the title of the thesis. The value will be typeset on the title page of the resulting PDF document, so you can use  $\LaTeX$  formatting commands within the value. If the value of the key is unspecified, the value of the **title** key will be used instead.

**titleEn** This key can be used to specify the English title of the thesis. Do not use any  $\LaTeX$  formatting commands within the value.

**author** This key can be used to specify the full name of the author.

**keywords** This key can be used to specify a list of keywords for your thesis. The value will be stored as one of the properties of the output PDF file; do not use any L<sup>A</sup>T<sub>E</sub>X formatting commands within the value.

**advisor** This key can be used to specify the full name of the thesis advisor.

**gender** This key can be used to specify the gender of the author. It is used to determine the suffixes employed in the Czech and Slovak locales. If you are typesetting your document in English, you don't need to specify this information. The valid values include:

**m** Male

**f** Female

**type** This key can be used to specify the type of the thesis. The recognized types of theses include:

**bc** Bachelor's thesis

**mgr** Master's thesis

**d** Doctoral thesis

**r** Rigorous thesis

**faculty** This key can be used to set the faculty at which the thesis is going to be defended. To choose the Faculty of Science, use **sci** as the value.

**departmentEn** This key can be used to specify the English name of the department at which the thesis is going to be defended. If you are typesetting your thesis in English, this value does not need to be specified.

**programme** This key can be used to specify the name of the author's study programme.

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**programmeEn** This key can be used to specify the English name of the author's study programme. If you are typesetting your thesis in English, this value does not need to be specified.

**field** This key can be used to specify the name of the author's field of study.

**fieldEn** This key can be used to specify the English name of the author's field of study.

**date** This key can be used to specify the date of the thesis submission in the YYYY/MM/DD format, where YYYY stands for the full year, MM stands for the month, and DD stands for the day of month.

**assignment** This key can be used to specify a list of PDF files containing the scanned thesis assignment. The list should be in the following format:

path/to/first/file.pdf, path/to/second/file.pdf, ...

Apart from the single-paragraph `\thesissetup` command, the following keys can be configured with multiple paragraphs of text as the value using the command

```
\thesislong{key}{%  
  The first paragraph  
  
  The second paragraph  
  ...  
}
```

**abstract** This key can be used to specify the abstract of the thesis.

**abstractEn** This key can be used to specify the English abstract of the thesis. If you are typesetting your thesis in English, this value does not need to be specified.

**thanks** This key can be used to specify the text of the acknowledgement.



**declaration** This key can be used to specify the text of the declaration. If the value of the key is unspecified, the following text is going to be used instead in the English locale: *“Hereby I declare that this paper is my original authorial work, which I have worked out on my own. All sources, references, and literature used or excerpted during elaboration of this work are properly cited and listed in complete reference to the due source.”*

The complete list of metadata keys can be found in Section 2.2 of the technical documentation of the `fithesis3` class [7].



## 3 Advanced usage

This chapter contains a couple of tips for the advanced user, who may wish to configure the class beyond what the class options and the metadata settings offer. An understanding of how the main routine of `fithesis3` works is beneficial. The main routine is documented in Section 3.1 of the technical documentation of the `fithesis3` class [7].

### 3.1 Troubleshooting option clashes

If you need to load a package with a specific set of options and the package happens to be required by the `fithesis3` class, as specified in Section 1.1.2, you may experience an option clash error. If this problem occurs, prepend `\PassOptionsToPackage{options}{package}` before the `\documentclass[...]{fithesis3}` command. If you need to configure the package, you can do that anywhere after the document preamble. If the package needs to be configured within the preamble, you can load the `fithesis3` style files prematurely using the `\thesis@load` command as follows:

```
\documentclass[...]{fithesis3}
%% The preamble
\makeatletter\thesis@load\makeatother
%% Here goes the package configuration.
\begin{document}
  %% The document
\end{document}
```

Note that only a small portion of the packages loaded by `fithesis3` is loaded with a specific set of options. The rest of the packages is *lazy-loaded* (loaded only if the user hasn't already loaded them), in which case no clash is possible.

### 3.2 Changing the layout

If you are unsatisfied with the automatic arrangement of the mandatory parts of the thesis, you can disable it using the `autoLayout` metadata key:

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---

A document which, except for this line, is completely empty.

Figure 3.1: A document with disabled autoLayout

```
\documentclass[...]{fithesis3}
\thesissetup{
  faculty=sci,
  autoLayout=false}
\begin{document}
  A document which, except for this line,
  is completely empty.
\end{document}
```

This results in a document that only consists of the main matter of the thesis (see Figure 3.1). You can now manually insert the preamble and the postamble:

```
\documentclass[...]{fithesis3}
\thesissetup{
  faculty=sci,
  autoLayout=false}
\begin{document}
  \makeatletter\thesis@preamble\makeatother
  A document which once again contains all
  the mandatory parts of a thesis.
  \makeatletter\thesis@postamble\makeatother
\end{document}
```

We are now back to the original document. Instead of inserting the `\thesis@preamble` and `\thesis@postamble` commands into the document, we can insert only certain sections at the beginning and at the end of the document.

The `\thesis@preamble` and `\thesis@postamble` commands set up the proper environment and execute the `\thesis@blocks@preamble` and `\thesis@blocks@postamble` commands. To change the layout, it is sufficient to redefine `\thesis@blocks@preamble` and `\thesis@blocks@postamble` without changing the definition of `\thesis@preamble` and `\thesis@postamble`. For the Faculty of Science, `\thesis@blocks@preamble` expands to the following commands:

```
{\thesis@selectLocale
{czech}\thesis@blocks@coverMatter
\thesis@blocks@cover
\thesis@blocks@frontMatter
\thesis@blocks@titlePage
\thesis@blocks@clearRight
\thesis@blocks@bibEntry
\thesis@blocks@bibEntryEn
\thesis@blocks@abstract
\thesis@blocks@abstractEn
\thesis@blocks@assignment
\thesis@blocks@thanks
\thesis@blocks@declaration
\thesis@blocks@tables
}
```

and `\thesis@blocks@postamble` expands to the following commands:

*\empty*

To create a document that only contains the title page at the beginning of the document and the list of tables at the end of the document, we would use the following code:

```
\documentclass[...]{fithesis3}
\thesissetup{
  faculty=sci,
  autoLayout=false}
\begin{document}
  \makeatletter
    \def\thesis@blocks@preamble{\thesis@blocks@titlePage}
    \thesis@preamble
  \makeatother
  A document that only contains the title page and the
  list of tables.
  \makeatletter
    \def\thesis@blocks@postamble{\thesis@blocks@lot}
    \thesis@postamble
  \makeatother
\end{document}
```

The available blocks are documented in Section 3.6 of the technical documentation of the fithesis3 class [7].

## 3.3 Replacing the backend

Fithesis3 operates on top of the rapport3 class, which defines much of the document design. To change the backend class, you need to redefine the value of `\thesis@backend` from the default value of

```
[a4paper]{rapport3}
```

to a different value. This assignment needs to be performed prior to the `\documentclass` command. If you wanted to change the backend class of fithesis3 to the KOMA-Script `scrreprt` with the `a4paper` option, your document would start as follows:

```
\let\ChapFont\bfseries
\let\PageFont\bfseries
\makeatletter
  \def\thesis@backend{[a4paper]{scrreprt}}
\makeatother
\documentclass[...]{fithesis3}
%% Here goes the rest of the document.
```

The `\ChapFont` and `\PageFont` commands are provided by the `rapport3` class, but not by the `scrreprt` class, which is why we needed to define them manually. Inconsistencies between different backend classes need to be resolved on a case-by-case basis.

## Bibliography

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