Guide on Writing Thesis Using *fithesis2* Class

Stanislav Filipčík

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1 Introduction

This document is intended as a guide on how to use *fithesis2* LaTeX document class in order to write bachelor and master thesis. It describes installation and usage of *fithesis2* class as a template for writing thesis. Even though the purpose of the class is aimed at students of Faculty of Informatics Masaryk university (FI), the usage is not limited only to them.

On the one hand this document shows options on writing thesis, on the other hand it is not intended as a complete guide to LaTeX typesetting system. Therefore, if you are complete beginner to LaTeX or TeX, I recommend that you first read one of the documents bellow, as this guide assumes you have a basic knowledge of LaTeX system.

- *The (Not So) Short Introduction to LaTeX 2$_\varepsilon$* by Tobias Oetiker et al. with a number of translations available on [Oetiker et al., 2008]. Czech translation is available from [Oetiker et al., 1998].
- *LaTeX for Complete Novices* by Nicola Talbot available on [Talbot, 2008].
- *Guide to the LaTeX markup language* available on Wikibooks [Wikibooks, 2008].

In reading this document, the following presents summary of typographic conventions used in this document.

Lines containing examples of LaTeX commands are illustrated in a typewriter type of font.

```
\documentclass{fithesis2}
```

Names of LaTeX packages or classes are displayed using slanted font (e.g., *fithesis2*).

In addition to that, executable commands are illustrated with typewriter font in a rectangular box.

```
pdflatex document.tex
```

2 Getting Started

LaTeX is a macro package based on TeX typesetting program. It enables users to typeset their documents at the highest typographical quality that can *not* be achieved when using WYSIWYG[1] word processor. Among others, main advantages of using LaTeX are:

- LaTeX produces professionally crafted documents.
- Mathematical formulae can be easily created.
- Complex structures such as indexes, table of content, etc. can be easily typeset.

2.1 Installing TeX distribution

This part of of the the guide contains information on how to obtain and install TeX distribution on Windows, Linux and Mac OS X to enable LaTeX support. If you already have some TeX distribution installed on your system, you can skip this section.

2.1.1 MS Windows

The best choice for Windows users is definitely installing MiKTeX distribution. Significant feature of MiKTeX is that it will download all necessary packages by itself. The distribution can be downloaded from http://www.miktex.org. Installation guide is available on on the same page.

[1] WYSIWYG stands for "What you see is what you get". MS Word and OpenOffice.org are example of such concept

2.1.2 GNU/Linux

Whereas MiKTeX is the best choice for Windows platform, users of Unix-like should pick TeX Live distribution. If you are using Linux, there's a high chance that you have TEX distribution already installed or can be simply installed by your Linux distribution package manager. If it is not your case, please refer to the TeX Live project page available on http://www.tug.org/texlive/ where the information on download and installation can be found.

2.1.3 Mac OS X

Mac users can download and install MacTeX distribution which provides full installation of LATEX. The distribution and all necessary information, including installation guide, are available on http://tug.org/mactex/.

2.2 Producing Document

LATEX is able to natively produce documents in two formats – DVI and PDF. Many others can be used by various types of transformations. The figure 1 shows options of obtaining PDF, DVI and PS formats from LATEX source. The file formats are represented by boxed red text, where LATEX is the source file. Blue text represents executable commands that are needed in order to produced demanded file format. Finally, the green text under the boxes with file formats represents which images formats are supported.

For example, if you want to produce your thesis in PDF format. You should execute command `pdflatex your_thesis.tex`. If your thesis contains images, they should be in `.jpg`, `.png` or `.pdf` format.

Alternatively, you can produce the thesis in PDF format by executing:

```
latex your_thesis.tex
dvipdfm your_thesis.dvi
```

commands. However, if your thesis contains images, these should be only in `.eps` format[2].

[2]You can use GIMP program to transform images to various formats. The program is available to download from http://www.gimp.org/.

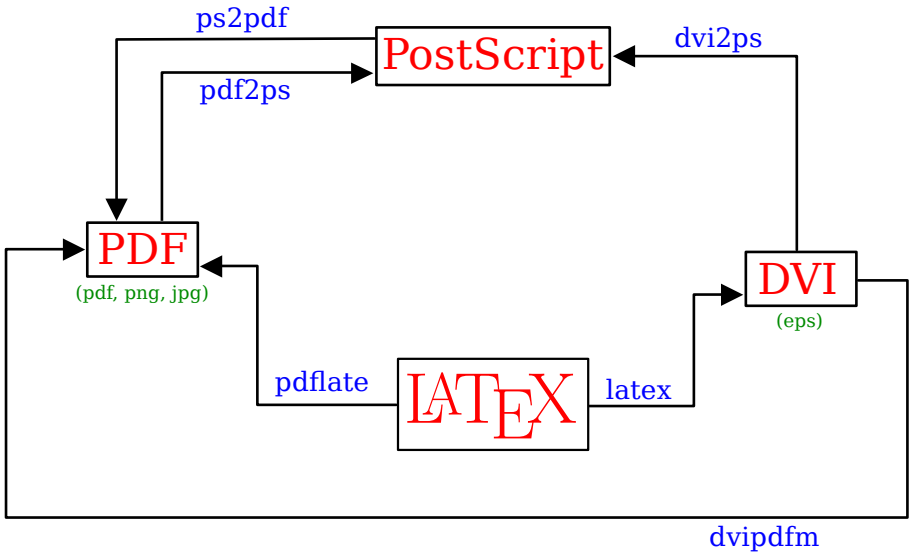

Figure 1: Formats generatable from LaTeX source (Image source: Wikibooks)

Operating system	encodings
Windows	cp1250
Unix-like	utf8, latin2

Table 1: Standard Central and Eastern European encodings

2.3 Encoding of the Input Document

LaTeX is employed on various types of computer systems that use plenty of different encodings. In order to handle the input encoding, you should use *inputenc* package that tells LaTeX which encoding is used. To employ the package, add the following line in the document preamble[3].

```
\usepackage[<encoding>]{inputenc}
```

The parameter <*encoding*> specifies encoding of input document. Standard encodings used in Central and Eastern Europe are shown in the table 1.

[3]The area between commands `\documentclass` and `\begin{document}`.

2.4 Language Support

Every language has its specific typographic rule. Therefore, we should tell LaTeX which language support should be activated. Activation is done by adding package *babel* to preamble of the document.

```
\usepackage[<language>]{babel}
```

The *babel* package supports more than 40 different languages[4]. For example, if you want to enable support for Czech language, you should use

```
\usepackage[czech]{babel}
```

command. For more information concerning language support, see Internationalization section in [Wikibooks, 2008].

2.5 Advice on Writing a Thesis

This guide concerns exclusively about the visual style of the thesis. For information about contentual style, please refer to directions published by school you are studying.

Students of FI should read through the article *Rady pro psaní odborného textu*[5] [FI MU, 2008a]. As mentioned above, student of other MU faculties or schools should consult instructions published by school they are studying. To put the previously mentioned article in a nutshell:

1. You should have an idea what you want to communicate to readers.
2. You should know who your thesis is addressed to.
3. Write an outline of your thesis.
4. Follow the typography principles.

Besides, your thesis should satisfy requisites (e.g., thesis must contain table of contents, keywords, etc.) demanded by the school you are studying. FI requires formalities stated in the article *Pokyny pro vypracování závěrečné práce* [FI MU, 2008b]. Again, if you are studying other faculty than FI, refer to the article concerning thesis requisites issued by your school.

[4] Multiple languages have even option for dialect specification.
[5] Unfortunately, the article is available only in Czech.

3 Installation

3.1 About *fithesis2*

Fithesis2 is modified version of *fithesis* document class [Pavlovič, 2008]. As well as *fithesis*, *fithesis2* is based on *scrreprt* class that is part of KOMA-Script bundle [KOMA-Script, 2008] developed in order to replace standard LaTeX classes with emphasis on European typesetting standards. Therefore, if your TeX distribution doesn't come with *scrreprt*, you should install it manually[6].

Furthermore, *fithesis2* uses Palatino typeface. As the it is standard part of all TeX distribution, no additional download nor installation is needed.

3.2 Download Package

The archive you have downloaded comes with `fithesis2.cls` file and three additional files `fit10.clo`, `fit11.clo` and `fit12.clo`. The former is LaTeX document class, the latter are classes with size specifications of Palatino typeface loaded by the *fithesis2* class. Besides, the download archive contains directory `loga` with logos of MU's faculties.

The `tutorial.pdf` is the class documentation (i.e., this document).

3.3 Enabling *fithesis2* Support

The simplest way of enabling *fithesis2* support is to move class files into the directory of your choice along with a source file of your thesis and directory `loga`. Then when calling *(pdf)LaTeX*, program will at first search the directory with thesis source file to find the document class.

Alternatively, you can install *fithesis2* system-widely[7]. To do so, you can install it either by moving `fithesis.cls` to appropriate texmf directory

[6] Most of the TeX distribution includes KOMA-Script bundle. In case your distribution is exception, information on installing the bundle is available in document [KOMA-Script, 2008].

[7] System-wide installation allows other users of the computer to use the *fithesis2* support whereas personal installation will enable the *fithesis2* support only for your computer account. The system-wide installation mostly requires administration's password.

or by using package manager[8] of your TEX distribution. In both cases, you should refer to documentation of your distribution.

4 Typesetting Thesis

4.1 Sample Document

The following example illustrates usage of *fithesis2*. The source code can be used as a template for writing your thesis. Don't be afraid that you probably don't understand LATEX commands bellow, they will be described in detail in the next section. The percent sign indicates start of the comment.

```
\documentclass[12pt,oneside,draft]{fithesis2}
\usepackage[english]{babel} % package for multilingual support
\usepackage[cp1250]{inputenc} % Windows OS encoding
\usepackage[T1]{fontenc}
\usepackage[plainpages=false,pdfpagelabels,unicode]{hyperref}

\thesistitle{Sample thesis} % enter thesis title
\thesissubtitle{Bachelor thesis}
\thesisstudent{Jane Doe}    % name of the author
\thesiswoman{true}          % defines author's gender
\thesisfaculty{fi}
\thesisyear{spring 2008}
\thesisadvisor{John Foo, Ph.D.} % fill in advisor's name
\thesislang{en}                 % thesis is in English

\begin{document}
\FrontMatter
\ThesisTitlePage

\begin{ThesisDeclaration}
\DeclarationText
\AdvisorName
\end{ThesisDeclaration}

\begin{ThesisThanks}
I would like to thank my supervisor...
\end{ThesisThanks}

\begin{ThesisAbstract}
```

[8] This feature is available in MiKTeX and TeX Live 2008.

```
The aim of the bachelor work is to provide...
\end{ThesisAbstract}

\begin{ThesisKeyWords}
keyword1, keyword2, etc.
\end{ThesisKeyWords}

\MainMatter
\chapter{Introduction}
This is the first chapter of the thesis.

\chapter{Another chapter}
...

\tableofcontents          % prints table of contents

\chapter{Introduction}    % first chapter followed by
                          % many others

\bibliographystyle{plain} % sets plain bibliography style
\bibliography{bib-db}     % BibTeX database file

\end{document}
```

4.2 Document Class and Its Options

The first line of the thesis has to contain command specifying document class. To enable *fithesis2* support, your first line of the source code should be:

```
\documentclass[<options>]{fithesis2}
```

The <*options*> parameter allows to override class file default behaviour. *fithesis2* supports following options:

`10pt`, `11pt`, `12pt` Sets the base font size of the thesis. If no size options is given, `12pt` is default.

`oneside`, `twoside` Defines whether single or double sided thesis should be produced. When `twoside` option is given, beginning of chapter is generated on odd page (i.e., right-hand page). When no option is given, `oneside` is the default.

onecolumn, twocolumn Specifies whether the document should be typeset in one column (this is default and recommended) or two columns.

draft, final If you use the option `draft`, lines with "overfull hbox" (this mostly occurs when LaTeX is not able to hyphenate a word) will be mark with black rectangle on the right side to indicate this. Moreover, the option `draft` is, when specified, passed to other packages like *graphicx*, *hyperref*, etc. In such cases you can use `final` option to suppress this behaviour.

The easiest way to understand this is to look at an example:

```
\documentclass[12pt,oneside,draft]{fithesis2}
```

instructs LaTeX to generate the thesis with a base font size of *12 points*. The layout will be *single sided* with text in *one column*. Additionally, the "overfull hbox" lines will be indicated with black rectangle as *draft* option is specified.

4.3 Title Page

To correctly typeset title page of the thesis, few simple macro commands must be included in the document's preamble. The necessary macros are listed below.

Students of schools other than MU should read the section bellow this one to produce title page with information about their school.

thesistitle{<*title*>**}** Inserts title of the thesis where <*title*> parameter defines the title.

thesissubtitle{<*subtitle*>**}** Defines type of the thesis. <*subtitle*> parameter stands for the type (e.g., Bachelor thesis, Master thesis, Bakalářská práce, etc.).

thesisstudent{<*name*>**}** Sets the name of the thesis author.

thesiswoman{*true*/*false***}** Sets the author's gender. If the value is *true*, the author of thesis is woman, *false* value indicates man.

thesislang{<*language*>} Specifies language of the thesis. Supported values are *cs*, *sk*, *en*, which stands for Czech, Slovak and English language.

thesisadvisor{<*name*>} <*name*> specifies the name of the thesis supervisor.

thesisfaculty{<*faculty*>} Sets faculty the author is studying at and typesets its name and corresponding logo on the title page. Currently supported values (i.e., faculties of MU) are:

- *fi* – Faculty of Informatics,
- *sci* – Faculty of Science,
- *law* – Faculty of Law,
- *eco* – Faculty of Economics and Administration,
- *fss* – Faculty of Social Studies,
- *med* – Faculty of Medicine,
- *ped* – Faculty of Education,
- *phil* – Faculty of Arts,
- *fsps* – Faculty of Sports Studies.

thesisyear{<*year*>} Inserts year of thesis elaboration.

Typesetting of the title page itself is done by inserting macro commands

```
\FrontMatter
\ThesisTitlePage
```

The two macros should be the very first two commands inserted immediately after `\begin{document}`. `\FrontMatter` macro turns on page numbering to Roman numerals.

4.3.1 Title Page for Non MU Thesis

To produce title page with the name and logo of your school you have to add following extra macro commands to those mentioned above. Besides, don't include macro `\thesisfaculty{}`.

thesisuniversity{<*name*>**}** Parameter *name* specifies the name of your school that will appear on the title page of your thesis.

thesislogo{logo_file**}** The macro specifies which file should be typeset on the title page. Parameter `logo_file` must have the same name as the logo to print. More information about supported formats are in the section 4.3.2.

Additionally, to typeset the place of your school on the title page, the macro `\thesisyear{}` should contain name of your school. For example:

```
\thesisyear{Boston, 2008}
```

4.3.2 Logo

In order to properly typeset logos of MU faculties, you have to copy appropriate logo from directory `loga` to directory with your thesis source. For example, if you are studying Faculty of Arts, choose file `phil-logo.pdf` (if you are compiling with *pdflatex*) or `phil-logo.eps` (if you are compiling with *latex*) and paste it to the directory with thesis source.

If the logos included in `loga` directory does not suit your needs (e.g., you are not student of MU), you can use your own logo. Instructions how to use your logo can be divided into two parts:

1. Author of the thesis is student of MU, therefore logo file should be named `<faculty>-logo.<image_format>`. For example, logo of Faculty of Arts has to be named `phil-logo.`<image_format>. Image formats supported by LaTeX are illustrated in figure 1.

2. Author of the thesis is not from MU. In such case, logo file should be named as parameter specified in `\thesislogo{}` macro command. For example, the macro is `\thesislogo{b-logotype}` so the logo file must be named `b-logotype.<image_format>`. Again, the image formats supported by LaTeX are illustrated in figure 1.

In order to properly typeset logos of MU faculties, one thing must be fulfilled. The logo file to print must be included in the same directory as file `fithesis2.cls`.

If the logos of faculties of MU in the directory `loga` does not suit your needs. You can optionally replace them with your own.

4.4 Thesis Requisites

This section describes formal requisites to thesis demanded by FI [FI MU, 2008b] and the methods of fulfilling them. If you are submitting the thesis to school other than MU, you should learn thesis requisites compulsory for your school.

4.4.1 Declaration

Declaration is printed by inserting LaTeX `ThesisDeclaration` environment with macro commands `\DeclarationText` and `\AdvisorName` within the environment.

```
\begin{ThesisDeclaration}
\DeclarationText
\AdvisorName
\end{ThesisDeclaration}
```

If the text of the declaration does not suit your needs, you can change it by redefining `\DeclarationText` macro . Redefinition can be done by command `\renewcommand{\DeclarationText}{`*custom text of declaration*`}`.

4.4.2 Acknowledgement

You can express your gratitude to those who help you in the process of writing the thesis, e.g. your supervisor. The acknowledgement can be printed by inserting the environment `ThesisThanks` with the thankful words within.

The acknowledgement is not compulsory, albeit appropriate. The length of it should not exceed one page.

4.4.3 Abstract

To typeset abstract of the thesis, you should insert the `ThesisAbstract` environment with your summary of the thesis inside it.

The abstract should give an indication of the parameters of the thesis study, its context and the scholarly contribution it makes. The length of it should not be longer than one page.

4.4.4 Keywords

Keywords[9] should be placed within `ThesisKeyWords` environment separated by a comma. The number of keywords is usually from five to ten.

4.5 Main Part of the Thesis

To indicate the beginning of the thesis main part, macro `\MainMatter` must be inserted before the first chapter of the thesis. It switches page numbering back to Arabic and restarts the page counter. Because two types of numbering – Roman and Arabic – is used, you should load *hyperref* package with options *plainpages=false* and *pdfpagelabels*. This is done inserting

```
\usepackage[plainpages=false,pdfpagelabels]{hyperref}
```

in the document preamble. The *hyperref* package should be the very last line before `\begin{document}` as it redefines lots of commands. For more details on *hyperref* package, refer to [Rahtz and Oberdiek, 2008].

4.5.1 Table of Contents

Although, the table of contents (TOC) is not demanded by [FI MU, 2008b], it is highly recommended to include it as it makes easier for reader to navigate through the thesis.

To put the TOC in the document, add command `\tableofcontents`. TOC will be printed at the place where the command is issued. By default, *fithesis2* adds to TOC all non-asterisk sectioning commands up to `\subsubsection{}`. To change the depth to which sectioning commands will be included in TOC, use command `\setcounter{tocdepth}{`*level*`}`. Parameter *level* indicates the depth of TOC. For example, if the *level* is 2, TOC would contain sections `chapter`, `section` and `subsection`. For further details refer to table 2.

Optionally, you can typeset list of figures and list of tables with commands `\listoffigures`, respectively `\listoftables`. Both macros operate analogously to the `\tableofcontents` command.

[9] Keyword can be composed of one or more words

Sectioning command	*level*
`\chapter{}`	0
`\section{}`	1
`\subsection{}`	2
`\subsubsection{}`	3
`\paragraph{}`	4
`\subparagraph{}`	5

Table 2: Sectioning commands with depth level values

4.5.2 Main Document

In order to structure your thesis, you should use sectioning commands described in the table 2. The first chapter should be *Introduction* which introduces the aim of your thesis and sets it in the context. Logically, the last chapter should be *Conclusion* which summarizes thesis contribution and findings.

4.5.3 Appendices

Beginning of thesis appendices is indicated by command `\appendix`. Following numbering of sectioning commands will be switched from decimal numbers to capital letters.

4.6 Generating Bibliography with BibTEX

Incorporating bibliography into the thesis is not only important task, but also compulsory (according to [FI MU, 2008b]). The bibliography should be printed after the last section of the thesis and before appendices.

To produce the bibliography, you can use either the `thebibliography` environment or auxiliary program called BibTEX that standardly comes bundled with TEX distribution. The advance of BibTEX program is that it is more powerful and flexible than the `thebibliography` environment. BibTEX allows to store references in an external plain-text file[10].

BibTEX file is consisted of one or multiple entries. The structure of the entry is illustrated on the example:

[10]The file has usually `.bib` extension.

```
@book{knuth73,
    author = "Donald E. Knuth",
    title = "Seminumerical Algorithms",
    volume = 2,
    series = "The Art of Computer Programming",
    publisher = "Addison-Wesley",
    year = "1973",
}
```

Each entry begins with declaration of reference type in the form *@type*. Except the *book* in example, BibTEX supports several other types such as *article phdthesis* and *inproceedings* for conference papers. The attribute after the opening curly bracket is called citation key. It is used to cite the certain document in the thesis source. The attributes behind the citation key are used to describe cited document and are separated by comma. For further details on the structure of BibTEX file, see section *Bibliographies* available on [Roberts, 2005].

To cite certain document (must be specified in `.bib` file), insert command `\cite{`*cite_key*`}` in place where you want to see the citation. To produce thesis bibliography, place following commands in the document.

```
\bibliographystyle{plain}
\bibliography{bib_file}
```

The first command tells LATEX which bibliography style (i.e., how to format references) to use – *plain* style in this case. The second command specifies the `.bib` file with bibliography items.

Note that to print bibliographic references correctly, sequence of commands

1. `pdflatex` *your_thesis*
2. `bibtex` *your_thesis* (do *not* use `.tex` extension)
3. `pdflatex` *your_thesis*
4. `pdflatex` *your_thesis*

must be executed in order to satisfy all cross-references. The first command generates the PDF file with no citation at all. That is because the external tool, BibTEX, was used to handle references. Therefore, the next thing is to run bibtex on the thesis source to define references within thesis. The third and the fourth command are required in order to incorporate the references into the document and to update all of the cross-references.

5 Additional Tips

5.1 Typesetting Czech Quotation Marks

Some TEX distribution does not provide macro command to correctly typeset Czech quotation marks. If it is the case of your distribution, download `cslatexquotes.sty` created by Michal Růžička from [Růžička, 2008], place it in the directory along with your thesis and load the package with command `\usepackage{cslatexquotes}` in the thesis preamble. You are now able to print the Czech quotation marks with `\uv{}` command. For more details see the project's web page [Růžička, 2008].

5.2 Typesetting Programming Code

To put programming code into the thesis, you can use either the `verbatim` environment for long listings and `\verb` command for code snippets or you can use *listings* package. The latter supports all the common programming languages. Moreover, the package automatically breaks long lines and supports highlighting of code. For more details on usage see [Heinz and Moses, 2007].

5.3 Useful Links

As this guide does not cover all information related to LATEX typesetting system, you can use the following hyperlinks for further study of LATEX or TEX system.

- *TeX Frequently Asked Questions on the Web* available from `http://www.tex.ac.uk/faq`,

- *The Comprehensive TeX Archive Network* available from http://www.ctan.org/.
- *Často kladené otázky o TeXu a odpovědi na ně* available on http://www.fi.muni.cz/cstug/csfaq/,

References

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C. Heinz and B. Moses. The Listings Package. 2007. URL http://tug.ctan.org/tex-archive/macros/latex/contrib/listings/listings.pdf.

KOMA-Script. CTAN download page, 2008. URL http://www.ctan.org/tex-archive/macros/latex/contrib/koma-script/. [Online; accessed 14-December-2008].

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N. Talbot. LaTeX for Complete Novices. 2008. URL http://theoval.cmp.uea.ac.uk/~nlct/latex/novices/. [Online; accessed 19-December-2008].

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