

The uefcsthesis class*

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Abstract

This package contains the \LaTeX class to typeset Bachelor's and Master's theses at University of Eastern Finland's School of Computing.

Contents

1	Introduction	2
2	Installation	2
3	Using the Class	3
3.1	Dependencies to Other Packages	3
3.2	Class Options	5
3.3	Document Metadata, Title Page, and Abstract	8
3.4	Multilingual Documents	10
3.5	PDF/A	12
3.6	Pre-Defined Commands and Environments for Mathematics	13
3.7	Support for Other Packages	14
4	Implementation	15
4.1	Package Options and Ifs	15
4.2	Setting Up the Outlook	19
4.3	Headers, Matters, and Appendices	21
4.4	The Bibliography	23
4.5	Title and Abstract Pages and Multilingual Support	24
4.6	Commands for Mathematics	36
4.7	Support for Other Packages	38
4.8	PDF/A and Hyperlink Support	40
4.9	Last Bit	42
4.10	Minimal Example Files	42
4.11	Bibliography Records	47

*This document corresponds to uefcsthesis v0.6.0, dated 2023/08/16.

1 Introduction

This package contains the \LaTeX class `uefcsthesis` that is meant for typesetting Bachelor's and Master's theses at University of Eastern Finland's (UEF's) School of Computing. This documentation provides the details about the package itself; separate documentation provides examples on how to use the class to typeset the thesis, and how to use \LaTeX in general. Thus, most students should be able to start working with their theses without reading this document first.

It is, however, recommended that everybody using this class (*students and supervisors alike*) read [Section 3](#) at some point as it provides the details of the class' features. [Section 4](#) is only needed if one wants to see how the class is implemented, perhaps to improve it or to do debug it.

The design goals of this class were to provide a class that:

1. Makes it easy for students to start writing their theses even with no prior experience on \LaTeX .
2. Provides standard \LaTeX interface for typesetting the document so that students learn how to use most \LaTeX classes.
3. Supports both the more traditional pdf \LaTeX engine as well as the more modern Lua \LaTeX and Xe \LaTeX engines.
4. Supports both \BibTeX and \BibLaTeX .
5. Supports theses in both Finnish and English (in both American and British spelling) and facilitates the use of other languages, especially by supporting UTF-8 encoding.
6. Is easy to adapt if needed.
7. Has clean and well-documented implementation.

2 Installation

The class is normally distributed as a standard \LaTeX `.cls` file, and it can be used by copying the `uefcsthesis.cls` file in a place where \LaTeX will find it (e.g. in the same folder with the main `.tex` file). To compile the document, the `uef_logo.pdf` file¹ has to be in the same folder as the main `.tex` file (or in a folder defined with the `\graphicspath` command, see [\[3\]](#)).

The source code of the class and this documentation are in `uefcsthesis.dtx` file that has to be used with `uefcsthesis.ins` file. To prepare the `uefcsthesis.cls` file, run

```
latex uefcsthesis.ins
```

in the command line. This will also produce the `uefcsthesis.xmpd` and `uefcsthesis.bib` files that will be needed to prepare this documentation. To prepare the documentation, run the following commands in the command line:

```
pdflatex uefcsthesis.dtx
```

¹The file `uef_logo.eps` is needed if standard \LaTeX is used instead of pdf \LaTeX , Lua \LaTeX , or Xe \LaTeX .

```

bibtex uefcsthesis
makeindex -s gind.ist -o $(PACKAGE).ind $(PACKAGE).idx
makeindex -s gglo.ist -o $(PACKAGE).gls $(PACKAGE).glo
pdflatex uefcsthesis.dtx
while ( grep -q '^LaTeX Warning: Label(s) may have changed' uefcsthesis.log )
do pdflatex uefcsthesis ; done

```

Notice that the last two lines are part of the same command, but they have to be separated with a newline.

If you have standard Unix `make` utility, you can use the package's `Makefile` and issue

```

make uefcsthesis.cls
make uefcsthesis.pdf

```

in the command line to make the class file and documentation.

The documentation depends on the following packages. They all are part of the standard L^AT_EX distributions such as MiK_TE_X and T_EX Live.

- | | |
|--------------------------|-------------------------|
| • <code>inputenc</code> | • <code>hypdoc</code> |
| • <code>fontenc</code> | • <code>urlbst</code> |
| • <code>babel</code> | • <code>listings</code> |
| • <code>amsmath</code> | • <code>tabularx</code> |
| • <code>microtype</code> | • <code>booktabs</code> |
| • <code>hologo</code> | • <code>caption</code> |
| • <code>url</code> | • <code>multicol</code> |
| • <code>seealso</code> | |

3 Using the Class

To use the class, give its name as a parameter for the L^AT_EX's `\documentclass` command near the begin of the main `.tex` file:

```
\documentclass{uefcsthesis}
```

The class expects that the text is encoded in UTF-8 encoding. The class also requires that some metadata must be set. An example minimal file is provided in Listing 1.

3.1 Dependencies to Other Packages

The `uefcsthesis.cls` class depends on a number of other packages. These are listed below. The packages marked with a star might or might not be loaded, depending on the class options (see Section 3.2).

Listing 1: Minimal .tex file for uefcsthesis.cls.

```

\documentclass[mscthesis,english,oneside,biblatex]{uefcsthesis}
%% Correct the below with the name of your bibliography file
\addbibresource{minimal.bib}

%% Replace all capital text with your own information.
\title{TITLE} % Title of the thesis
\author{GIVEN NAME}{FAMILY NAME} % Your name
\date{\thismonth} % The month and year of handing in your thesis, or \thismonth of automatic
\city{CITY} % Either Kuopio or Joensuu
\firstsupervisor{GIVEN FAMILY} % Name of the first supervisor
\secondsupervisor{GIVEN FAMILY} % Name of the second supervisor, if any
\keywords{KEYWORD1\sep KEYWORD2\sep ETC} % Keywords must be separated with \sep

%% To get the ACM CCS classification, you can visit
%% https://dl.acm.org/ccs/ccs.cfm
%% There you can find a tool to generate LaTeX code for the classification
%% Copy it here. You don't need to copy the XML at the begin, though.
%% For example,
%% \ccsdesc[500]{Some Class}

\begin{document}
\maketitle
\begin{abstract}
WRITE YOUR ENGLISH ABSTRACT HERE
\end{abstract}

%% If you need your abstract also in Finnish, you can use
%% \begin{abstract}[finnish] ... \end{abstract}

\frontmatter
\tableofcontents
\mainmatter

\chapter{Introduction}
\label{cha:intro}

WRITE YOUR INTRODUCTION HERE

WRITE THE REST OF THE THESIS HERE

THIS IS AN EXAMPLE OF USING CITATIONS:
Graph generators are important \citep{metzler18random}.
\citeth{kalofolias18from} discuss sets of redescriptions.

%% Next comes the references
\printbibliography[heading=bibintoc]

\backmatter % Do not remove!

```

- `amsmath`
- `amsthm`
- `appendix`
- `array`
- `babel`*
- `biblatex`*
- `bm`
- `booktabs`
- `caption`
- `changeccntr`*
- `comment`
- `csquotes`
- `etoolbox`
- `fancyhdr`
- `fontenc`*
- `fontspec`*
- `geometry`
- `graphicx`
- `hyperref`*
- `ifluatex`
- `ifthen`
- `ifxetex`
- `inputenc`*
- `mathtools`
- `microtype`
- `natbib`*
- `newtxmath`
- `newtxtext`*
- `pdfx`*
- `polyglossia`*
- `setspace`
- `textcomp`
- `tocbibind`
- `xparse`

3.2 Class Options

The class takes a number of options that control its behaviour. The different options are listed in Table 1.

Thesis Type The main options control the thesis type. These are `mscthesis` and `bscthesis`. They also have Finnish aliases, `gradu` and `kandi`. None of these options have any effect on the language of the thesis (i.e. `kandi` doesn't set the language to Finnish nor does `mscthesis` set it to English). The `bscthesis` (and `kandi`) option do set some other features, though: it turns the layout for one-sided printing and changes the math numbering so that math counters do not reset at the start of chapters.

Language and Engine The language options are straightforward. The `uefcsthesis` class supports Finnish, US English, and British English as pre-defined languages using options `finnish`, `english`, and `british`, respectively. Setting the language changes all pre-defined strings and sets the hyphenation correctly.

The actual language support comes from the `babel` or `polyglossia` packages, depending on whether the `polyglossia` option is given. The support is (mostly) transparent to the end user (though `polyglossia` does support more complicated

Table 1: Options for loading the class. Options in the same group are mutually exclusive. The default for each group is listed first.

Group	Option	Description
Thesis type	mscthis	Sets the thesis type to Master's thesis
	gradu	Same as above
	bscthis	Sets the thesis type to Bachelor's thesis
	kandi	Same as above
Language	finnish	Sets the language to Finnish
	english	Sets the language to (US) English
	british	Sets the language to British English
Engine	polyglossia	Activates the polyglossia package instead of the babel package (using babel is the default)
Printing	oneside	Adapts the layout for one-sided printing
	twoside	Adapts the layout for two-sided printing
Finalizing	final	Produce finalized output
	draft	Produce draft output
Numbers	lining	Activates the lining figures
	osf	Activates the old-style figures
Bibliography engine	bibtex	Activates the support for the BibTeX bibliography engine
	biblatex	Activates the support for the biblatex bibliography package with the biber engine
Citation style	authoryear	Activates the author–year citation style
	numeric	Activates the numeric citation style
Math numbering	chaptermathnum	Reset math environments' numbering at the begin of each chapter
	runningmathnum	Keep the same numbering throughout the thesis
Theorem numbering	sharedtheoremnumbers	All theorem-like environments share the same numbering
	separatetheoremnumbers	Each theorem-like environment has its own numbering
Hyperref-package	hyperref	Load the hyperref package
	nohyperref	Do not load hyperref
PDF/A	nopdfa	Do not generate the output in PDF/A format
	pdfa	Load pdfx package and produce PDF/A output; will also load the hyperref package
Logos & layout	uef	Use UEF layout
	imlex	Same as above, shows IMLEX logos on front page
	tut	Use Toyohashi University of Technology's recommended layout

cases), but it does set restrictions to the \LaTeX engine used: when using `babel`, one can use any \LaTeX engine; when using `polyglossia`, one can use either $\text{Lua}\text{\LaTeX}$ or $\text{Xe}\text{\LaTeX}$. Notice however that as of 2019, development of `polyglossia` seems to have stalled; currently it is recommended to use `babel` unless some special features of `polyglossia` are needed.

Printing, Finalizing, and Numbers The options `oneside` and `twoside` change the layout of the thesis suitable for one-sided and two-sided output. For digital use, one-sided output is preferable.

Another option controlling the layout is the `osf` option that changes the numbers to old-style figures. Using old-style figures requires one to be careful when writing numbers in the running text: the ‘mathematical numbers’ should always be surrounded by dollar signs as their outlook is markedly different from the ‘text numbers’. The opposite of old-style figures (and the default) is `lining` figures.

The finalizing options `final` and `draft` control the layout of various things. Many standard \LaTeX -packages check the `draft` option, and change their behaviour accordingly. For example, the `graphicx` package does not print the figures when the draft option is given, and \LaTeX prints black boxes next to overflowed lines to highlight them. On the other hand, the `uofcsthesis` class catches the `draft` options to make sure that the `microtype` package keeps working even in the draft mode.

Bibliography Engine and Citation Style \LaTeX has (and `uofcsthesis` supports) two bibliographical engines: $\text{Bib}\text{\LaTeX}$ and $\text{Bib}\text{\LaTeX}$ with `biber`. In general, the more modern $\text{Bib}\text{\LaTeX}$ package is recommended, but the more standard $\text{Bib}\text{\LaTeX}$ can also be used (and is better if one wants to use the work later with commercial publishers, who do not usually support $\text{Bib}\text{\LaTeX}$). You can mix-and-match the engines and use $\text{pdf}\text{\LaTeX}$ with $\text{Bib}\text{\LaTeX}$, for example.

Whichever bibliography engine is selected, `uofcsthesis` allows you to use `natbib`-like citation commands like `\citet` and `\citep`. The commands work in both author-year citation style (the default, with `auhtoryear`) and numerical citation style, which can be activated with the `numeric` option.

With $\text{Bib}\text{\LaTeX}$, the citation style is the `biblatex-apa` package [5]. With $\text{Bib}\text{\LaTeX}$, we are using the `apacite` package [6]. See their respective documentations for more information regarding the usage of the styles and various bibliography record types and fields supported.

Numbering in Mathematics There are two features of numbering of ‘mathematical objects’ that can be controlled in `uofcsthesis`. The first is whether the numbering of equations, as well as theorems, lemmas, and other theorem-like environments resets at the begin of every chapter. This is the default in Master’s theses, and these numbers are two-part, like (1.1). In Bachelor’s theses, the numbering is running throughout the thesis, and the numbers are one-part, like (1). Option `chaptermathnum` turns on the per-chapter numbering also for Bachelor’s theses and `runningmathnum` turn on the running numbering also for Master’s theses.

The other numbering feature that can be controlled considers the numbering of theorem-like environments (like `theorem`, `lemma`, `corollary`, etc.) By default (or when given the `sharedtheoremnumbers` option), these share the same counter, that is, Lemma 1 is followed by Theorem 2 which is followed by Corollary 3 and

so on. Option `separatetheoremnumbers` separates the counters, and Lemma 1 is followed by Theorem 1 which is followed by Corollary 1 and so on. More information regarding the theorem-like environments is in Section 3.6

Hyperref and PDF/A The `uefcsthesis` package can automatically generate PDF/A output using the `pdfx` package. This is controlled by the `pdfa` and `nopdfa` options. By default, generation of PDF/A is turned off, as it requires a sidecar file (see Section 3.5) and as PDF/A does not allow comments, it might harm the supervisor’s ability to comment the drafts. For the final deliverable, it is recommended to use the `pdfa` option (and to read Section 3.5 before doing that).

Even when no PDF/A is being generated, `uefcsthesis` uses the `hyperref` package to turn the references into hyperlinks and to add the PDF metadata. Sometimes `hyperref` package must be loaded after some user-loaded package; in these situations, the loading of `hyperref` by `uefcsthesis` can be turned off with the `nohyperref` option.

Logos & Layout In standard use, `uefcsthesis` shows only the UEF logo in the title page. With `imlex` option, the title page will instead show the logos of the IMLEX consortium. The default use of UEF logo can be forced with the `uef` option.

Both `uef` and `imlex` options use standard UEF layout. The layout recommended by the Toyohashi University of Technology can be activated with the `tut` option. This changes the margins and it’s recommended to have two separate main files, one for UEF layout and one for TUT layout.

3.3 Document Metadata, Title Page, and Abstract

The `uefcsthesis` class provides standard L^AT_EX commands for entering the document metadata (title, author, etc.) and for printing the title page and abstract. To support abstracts in different languages (e.g. Finnish and English), many commands are enhanced to take an optional argument that defines the language for which the metadata is set.

Entering Document Metadata

The document metadata must be entered in the document preamble, as it is needed at the begin of the document to fill in the PDF metadata.

`\title` The title of the thesis is set by `\title` macro, which can be called as `\title[⟨lang⟩]{⟨title⟩}`. The optional `⟨lang⟩` parameter can be used to set title in languages other than the document’s main language. This options use with `\subtitle` `\title` and other macros that support it is explained in Section 3.4. If the thesis has a subtitle, it’s given with `\subtitle[⟨lang⟩]{⟨subtitle⟩}` command.

`\author` The author name is given as `\author{⟨given name(s)⟩}{⟨family name⟩}`.

`\studentid` There’s no multilingual support for the author name, as of now. Student ID number can be entered with `\studentid{⟨ID number⟩}`. Currently the standard layout does not print this information, but the TUT layout does use it.

`\date` The date of the thesis is set as `\date[⟨lang⟩]{⟨date⟩}`. The mandatory argument `⟨date⟩` can be given as `\today`, but this prints the full date, while the standard is to have just the month and the year. To get the standard date format, `\thismonth` you can use the command `\thismonth` argument, i.e. `\date{\thismonth}` will

automatically use the current month and year in correct language as the date string. You do not need to add the date in Finnish and English if you use `\thismonth`.

`\city` The thesis must indicate whether it's done in Joensuu or Kuopio. This is done using the `\city` macro as `\city{<city>}`, where `<city>` is either Joensuu or Kuopio. The `\city` macro does also support the `<lang>` optional argument, but unlike the other macros, if none is given, the city name is set for all supported languages (Finnish, US English, and British English) as Joensuu and Kuopio are the same in all of them.

`\firstsupervisor` The name of the first (primary) supervisor is given as `\firstsupervisor{<name>}`, where `<name>` is given in 'given name(s) family name' format, for instance, `\firstsupervisor{Pauli Miettinen}`. If the thesis has a second supervisor, his or her name is given with `\secondsupervisor` command in exactly the same way as the first supervisor. These two macros do not take the language as an optional argument.

If the thesis has more than two supervisors, all but the last supervisors' names should be given in `\firstsupervisor`, separated with commas. The last supervisor's name is given with `\secondsupervisor`.

`\keywords` The thesis's keywords are given with `\keywords[<lang>]{<keywords>}` command. The `<keywords>` argument must be a list of keywords separated with `\sep` command.

`\sep` The `\sep` command creates the correct separator for different use cases (e.g. semicolon in the abstract page, comma in some metadata fields).

`\ccsdesc` The ACM 2012 Computing Classification System's (CCS) classification is given with the `\ccsdesc` macro that has the format `\ccsdesc[<level>]{<class>}`. The `<level>` argument describes the level of importance of the `<class>`. The `\ccsdesc` commands are expected to be generated with the ACM tool at <https://dl.acm.org/ccs/ccs.cfm>.

`\numberofappendices` If the thesis contains appendices, their number must be inserted with

`\appendixpagecount` `\numberofappendices{<num>}`. The `\appendixpagecount{<pages>}` macro is used to tell the class how many pages long the appendices in total are, and it is mandatory if `\numberofappendices` macro is given a value larger than 0.

When using the *TUT layout* (class option `tut`), abstract uses only values from `\author`, `\studentid`, `\date`, and `\firstsupervisor`. The supervisor for TUT layout must always be the TUT supervisor.

Special Pages and Document Structure

`\maketitle` The thesis title page is printed with the (standard) `\maketitle` command. The command doesn't take any arguments.

`abstract (env.)` The abstract of the thesis is written in the `abstract` environment, like

```
\begin{abstract}
  The text of the abstract
\end{abstract}
```

The `abstract` environment will also print the abstract page and populate it with the document metadata and page numbers.

To print an abstract in other language, the `abstract` environment can be called with an optional argument: `\begin{abstract}[<lang>]`. This will generate another abstract page, typeset in language `<lang>`.

`\frontmatter` The start of the 'front matter' of the thesis is indicated by the `\frontmatter`

macro, which is mandatory in every document using `uefcsthesis`. The front matter has roman pages numbers and it contains at least the table of contents

`preface` (*env.*) (generated with the `\tableofcontents` command). In addition of the table of contents, the front matter can contain the preface, that is written inside the `preface` environment, and the acknowledgements, written inside the `acknowledgements` environment. These environments do not have the language parameter, but the standard `\selectlanguage` command can be used to typeset them in other languages (see also Section 3.4).

`acronyms` (*env.*) Finally, acronyms can be set in the preface in their own page using the environment `acronyms`. This page does not have a separate-language version, as its contents should always be in the main language of the document. The actual table of acronyms can be done in different ways, e.g. using a simple manual table, the `acronyms` package, or the `glossaries` package.

`\mainmatter` The body of the thesis is written after the `\mainmatter` macro, which is again mandatory. After the list of references, starts the ‘back matter’, indicated by the `\backmatter` macro. The back matter contains the appendices, if any, but it is nonetheless mandatory, even in there are no appendices, as it is used to count the total number of pages in the thesis.

`appendices` (*env.*) The (possible) appendices come after the `\backmatter` macro and they are enclosed in `appendices` environment. For example,

```
\backmatter
\begin{appendices}
  \chapter{All The Stuff That Didn't Fit to the Main Text}
\end{appendices}
```

3.4 Multilingual Documents

The `uefcsthesis` package is designed to directly support theses written in Finnish or English, to support including text in other languages, and to be easy to extend to support especially abstract pages in other languages. It also allows to change the pre-defined strings with ease.

The main part of the multilingual support is that `uefcsthesis` assumes UTF-8 encoded input. Both `Lua1TeX` and `XYTeX` assume that by default, and for `pdfTeX`, we use the `inputenc` package with `utf8` option.

Abstract in English

The previous section detailed how to provide the metadata and produce the abstract page in the thesis’ primary language (i.e. in the language selected in the class options). Master’s and Bachelor’s theses should also include abstract page in English if the thesis is written in Finnish. To make that, the necessary metadata has to be provided in the secondary language (i.e. English) using the optional `<lang>` argument. At least `\title`, possible `\subtitle`, and `\keywords` have to be given in both languages.

To produce the actual abstract, give the optional `<lang>` argument to the `abstract` environment. Listing 2 shows an example of a Master’s thesis in Finnish with British abstract.

Listing 2: Example of a Finnish MSc thesis with British abstract.

```

\begin{documentclass}[mscthesis,finnish]{uefcstthesis}
\title{Otsikko}
\title[british]{Title}
\author{Oula}{Opiskelija}
\firstsupervisor{Rauni~P.~Rohvessori}
\secondsupervisor{Toini Tutkija}
\keywords{pro gradu –tutkielma\sep tieteellinen kirjoittaminen\sep esimerkki}
\keywords[british]{MSc thesis\sep scientific writing\sep example}
\begin{document}
  \maketitle
  \begin{abstract}
    Suomenkielinen teksti
  \end{abstract}
  \begin{abstract}[british]
    English text
  \end{abstract}
  \frontmatter
  % Rest of the thesis
\end{document}

```

Abstract in Other Languages and Changing Pre-Defined Strings

Students whose mother tongue is not Finnish or English might wish to include an abstract page in their mother tongue. It is recommended that Lua \LaTeX or Xe \LaTeX is used in these cases. If the language needs non-latin alphabet, the `uefcstthesis` class should be loaded with the `polyglossia` option.

Class `uefcstthesis` already loads Swedish in addition to the supported languages. To add another new language, `polyglossia`’s `\setotherlanguage` command must be called first [4, Section 2.1].

There are two ways to add an abstract in other languages. The first is to use the English abstract page and only write the text of the abstract (and potentially title and the keywords) in the other language. This can be done by calling the `abstract` environment with `english` as the optional argument and calling `polyglossia`’s `\lang` environment [4, Section 3]. For example,

```

\setotherlanguage{german}
\begin{abstract}[english]
  \begin{german}
    Kurzfassung auf Deutsch
  \end{german}
\end{abstract}

```

`\setstring` The alternative is to print the full abstract page in the target language. This requires that the `uefcstthesis` class is told the pre-defined strings in the new language. This can be done with the `\setstring` command, that is called as follows: `\setstring[⟨lang⟩]{⟨string name⟩}{⟨string text⟩}`. If no `⟨lang⟩` is given, the `\setstring` command changes the string for the document main language. The pre-defined strings that are used in the abstract page are listed in Table 2 together with their English and Finnish values.

Table 2: Pre-defined strings used in the abstract page

$\langle string\ name \rangle$	$\langle string\ text \rangle$ (English)	$\langle string\ text \rangle$ (Finnish)
<code>thesistype</code>	Master's thesis	Pro gradu -tutkielma
<code>field</code>	Computer Science	Tietojenkäsittelytiede
<code>departmentname</code>	School of Computing	Tietojenkäsittelytieteen laitos
<code>facultyname</code>	Faculty of Science and Forestry	Luonnontieteiden ja metsätieteiden tiedekunta
<code>universityname</code>	University of Eastern Finland	Itä-Suomen yliopisto
<code>pages</code>	p.	s.
<code>and</code>	and	ja
<code>keywordsname</code>	Keywords	Avainsanat
<code>supervisorname</code>	Supervisor	Ohjaaja
<code>supervisorsname</code>	Supervisors	Ohjaajat
<code>app@o</code>	appendix	liite
<code>app@m</code>	appendices	liitettä

The language-aware metadata commands (`\title` etc.) work with any language that has been added with `\setotherlanguage` (and Swedish, that is automatically included). A thesis that contains a Swedish abstract might have the following lines (among others):

```
\setstring[swedish]{universityname}{Östra Finlands universitet}
\setstring[swedish]{facultyname}{Naturvetenskapliga och forstvetenskapliga fakulteten}
\title[swedish]{Rubrik}
```

The `\setstring` command can be used to change the pre-defined strings in Finnish, English, and British, as well. If, for example, one wants to change the field of the thesis to Data Science (`datatiede`) in a Finnish MSc thesis with British abstract, that would require the following commands in the preamble:

```
\setstring{field}{Datatiede}
\setstring[british]{field}{Data Science}
```

Thanks to the UTF-8 support, `uefcsthesis` can support also non-latin alphabets, although writing systems that are not left-right are not tested or supported. The standard font does not support all fonts, though, so you might have to tell `fontspec` (assuming you're using `LuaLaTeX` or `XYLaTeX`, as you should) to use different font for Cyrillic text. Standard `LaTeX` comes with `Tempora` font, that is a Cyrillic font that looks similar to Times New Roman. To use it, add the following to the document preamble:

```
\newfontfamily\russianfont[Script=Cyrillic]{Tempora}
```

3.5 PDF/A

University of Eastern Finland requires that Master's theses are returned in PDF/A format. `uefcsthesis` allows direct generation of PDF/A output using the `pdfx`

Listing 3: Default minimal `.xmpdata` metadata file

```

\Title{\uef@pdf@title}
\Author{\@author}
\Keywords{\uef@keywords}
\Subject{\uef@pdf@subject}
\Publisher{\uef@s@universityname}
\endinput

```

package [9]. The generation of the PDF/A output can be activated with the `pdfa` class option. To successfully generate the PDF/A file, `pdfx` requires a sidecar file containing the document metadata. To obtain the default sidecar file, you rename the file `minimal.xmpdata` to `\thesisfile.xmpdata`. If your theses' main `.tex` file is called `opiskelija_oula_gradu.tex`, copy `minimal.xmpdata` to `opiskelija_oula_gradu.xmpdata`. The contents of the `minimal.xmpdata` file are provided in Listing 3.

In most cases, the default file will work fine. One should, however, *always check the metadata*. This can be done, e.g. in Adobe Reader, selecting **File**→**Document Properties**. If the thesis title, author name, or keywords contain (complex) \LaTeX commands, the metadata will not look good. In these cases, one should edit the `\thesisfile.xmpdata` file. It should be necessary to edit only the contents of the macros `\Title`, `\Author`, and `\Keywords`. The current macros (e.g. `\uef@pdf@title`) can just be replaced with the actual title, author name, and keywords, all in UTF-8 encoding, and separating the keywords with `\sep`. See the documentation of `pdfx` [9] for more information.

If the document uses other fonts than the standard ones (e.g. for typesetting Russian), `pdf \LaTeX` might not produce compliant PDF/A documents. In these cases, it is recommended to use `Lua \LaTeX` . On the other hand, as `uefcsthesis` produces files for the PDF/A-1b standard, if any of the figures contain layers or CMYK colours, the resulting file is not compliant. The validity of the generated file can be checked with the free VeraPDF application.²

`\hypersetup` As `pdfx` loads `hyperref` before you can load it yourself, you have to use the `\hypersetup` to configure the parts of `hyperref` that you might want to change (e.g. the colouring of the links). The `uefcsthesis` guarantees that `\hypersetup` exists, but if `hyperref` is not loaded, it doesn't do anything. For more information on how to use `\hypersetup`, refer to the `hyperref` documentation [10].

3.6 Pre-Defined Commands and Environments for Mathematics

The `uefcsthesis` class facilitates the typesetting of mathematics by defining most of the standard mathematical theorem-like environments and some other helper macros.

Theorem-Like Environments

The class uses the `amsthm` package to build the theorem-like environments. It defines a number of standard environments. The standard for these environments

²<http://verapdf.org/software/>, accessed 17 Dec 2018.

is `theorem` that is used to write a theorem. It, like the other theorem-like environments, takes one optional argument, contents of which will be typeset in parentheses after the word **Theorem**. The theorem will be numbered using a two-part number $x.y$, where x is the chapter number and y is the theorem number, except if option `runningmathnum` is given (or the thesis is Bachelor’s thesis), in which case the numbering scheme is one-part. The starred version will not print any number.

`lemma` (*env.*) The other theorem-like environments are `lemma`, `corollary`, `proposition`, and `conjecture`. Their numbering scheme is the same as with `theorem`, and by default, they have the same counter (i.e. Lemma 1 is followed by Theorem 2). This can be changed with option `separatetheoremmnumbers`.

`proof` (*env.*) The environment to typeset (short) proofs, `proof`, is provided by the `amsthm` class; see its documentation [8] for further information.

`definition` (*env.*) The environments `definition`, `problem`, and `example` are typeset differently, and they each have their own counters. These counters have the same format as `theorem`, though.

`remark` (*env.*) The last two environments, `remark` and `note`, have no numbers.

`note` (*env.*)

Convenient Macros for Typesetting Math

The `uafcsthesis` class provides few special macros that help typesetting math.

`\abs` The first macro is `\abs`, used to typeset ‘absolute value’ (i.e., two vertical bars). Its basic form is `\abs[⟨size⟩]{⟨stuff⟩}` that will put $\langle stuff \rangle$ inside properly-spaced vertical bars. If the optional argument $\langle size \rangle$ is given, it should be one of L^AT_EX’s delimiter sizing commands, like `\big`, and it will control the size of the bars. The command also has a starred version, `\abs*`, which is equivalent of putting `\left` and `\right` around the bars.

`\norm` Similarly to `\abs`, `\norm` produces double-vertical bars around its mandatory argument. It has similar sizing commands, so `\norm[\Bigg]{\frac{a}{b}}` will produce tall double-vertical bars.

Finnish mathematical text usually uses ‘inverted square brackets’ to indicate open end of an interval, like $]a, b[$. Notice, however, that L^AT_EX typesets the space around the inverted brackets wrongly. `uafcsthesis` provides three commands to facilitate the typesetting of such intervals: `\lointerval`, `\rointerval`, and `\ointerval` for left-open intervals $]a, b]$, right-open intervals $[a, b[$, and open intervals $]a, b[$, respectively. They take the same optional argument or starred form as `\abs` and `\norm`.

`\bm` Finally, `uafcsthesis` also loads the `bm` package. It allows one to use italic bold-face fonts in math by using the command `\bm` instead of `\mathbf`. Unfortunately, `bm` can sometimes cause issues by using many L^AT_EX font spots; see the manual [2] for more information, including ways to solve the issue.

3.7 Support for Other Packages

The `uafcsthesis` loads a few more packages, and provides support (mostly, Finnish translation) for further packages if they are loaded.

Tables and Figures

To insert the figures, `uefcsthesis` loads the `graphicx` package. You can use it to include your own figures and to customize the folder where you store the figures; see the package documentation [3] for more information.

To help typesetting tables, `uefcsthesis` loads `tabularx` and `booktabs` packages. Most importantly, the class allows users to use four new table column types: `C`, `L`, `R`, and `X`. Three first, `C`, `L`, and `R` create centered, left-aligned, and right-aligned columns – similar to standard `c`, `l`, and `r` – but set their contents in math mode. The math mode can be cancelled in a particular cell (e.g. in the caption) by surrounding the cell contents in dollar signs. These column types are convenient for typesetting simple tables with numbers, but see the `siunitx` package [11] for more complete approach for typesetting tables with numbers.

`tabularx` (*env.*) The last new column type, `X`, can only be used inside a new environment, `tabularx` and it creates a `p`-type column with automatically adjusting width. See the documentation of the `tabularx` package [1] for more information.

The `tabularx` package loads the `array` package, which provides some useful tools for defining material that will be repeated for every table cell in a column; see [7] for more information.

`\toprule` The `booktabs` package defines four macros for drawing rules in \LaTeX tables: `\midrule`, `\toprule`, `\midrule`, `\cmidrule`, and `\bottomrule`. These commands should be used instead of old `\hline`, and *vertical rules should never be used in tables*. The documentation for the `booktabs` package [?] explains how to design a good-looking table, and it is a recommended reading for anybody using \LaTeX .

Typesetting Algorithms

The `uefcsthesis` package does not provide any special commands for typesetting algorithms, but it supports the standard packages used to do it. Namely, `uefcsthesis` provides Finnish translations for the floating environment names and ‘list-of-algorithms’ lists for the packages `algorithm2e` and `algorithmicx`, often used to typeset pseudo-code, and for packages `listings`, `listingsutf8`, and `fancyvrb`, often used to typeset actual program listings.

4 Implementation

Most of the code in this package is for the `uefcsthesis.cls` class file (compiled with argument `cs`), but we also include the basic `xmpdata` file for `pdfx` package (compiled with the argument `xmp`).

```
1 <*cs>
```

4.1 Package Options and Ifs

We will record all package options in `\ifs`, so we start by defining them.

```
uef@mscsthesis These ifs will control the outlook of the thesis: whether it's an MSc or BSc thesis
uef@twoside    (default: MSc); whether it's printed one or two-sided (default: one); and whether
uef@osf        to use old-style figures (default: not).
                2 \newif\ifuef@mscsthesis\uef@mscsthesistrue
                3 \newif\ifuef@twoside\uef@twosidefalse
```

```

4 \newif\ifuef@osf\uef@osffalse

uef@polyglossia These ifs will control the language of the document; uef@polyglossia controls
uef@finnish whether to load the polyglossia package or the babel package (default: babel),
\uef@language and uef@finnish stores whether the document is in Finnish or in some other
language. In any case, the name of the language is stored in \uef@language.
5 \newif\ifuef@polyglossia\uef@polyglossiafalse
6 \newif\ifuef@finnish\uef@finnishtrue
7 \newcommand{\uef@language}{finnish}

```

uef@numbertheoremsbychapter These ifs control the behaviour of math environment numbering. If **uef@singlemathnumber** is true it means that Theorems, Lemmas, Propositions, and Conjectures use one number; otherwise, they each have their own number.

```

8 \newif\ifuef@numbertheoremsbychapter\uef@numbertheoremsbychaptertrue
9 \newif\ifuef@singlemathnumber\uef@singlemathnumbertrue

```

uef@biblatex Whether to use BIBL^AT_EX or BiB_TE_X (default: BiB_TE_X), and which style to use
\uef@biblatexstyle (default: authoryear-comp)

```

10 \newif\ifuef@biblatex\uef@biblatexfalse
11 \newcommand{\uef@biblatexstyle}{authoryear-comp}

```

uef@hyperref These if's control whether we load the **hyperref** package and the **pdfx** package. As
uef@pdfa **pdfx** loads **hyperref**, we don't load the latter if the former is loaded. Sometimes it's also useful to not load **hyperref** here, but to postpone it for later.

```

12 \newif\ifuef@hyperref\uef@hyperreftrue
13 \newif\ifuef@pdfa\uef@pdfafalse

```

uef@imlex The **uef@imlex** test controls whether we want to show the IMLEX logo in the
uef@tut main page or the standard UEF logo. Also adds the name of the IMLEX program to the main page. The **uef@tut** test controls whether we want to activate TUT layout.

```

14 \newif\ifuef@imlex\uef@imlexfalse
15 \newif\ifuef@tut\uef@tutfalse

```

Package Options

With the ifs defined, we can define the class options to set the ifs in the correct way.

mscthis The most important option is the type of the thesis. MSc theses are by default
bscthis two-sided and have their theorem counter(s) reset in every chapter, while BSc
gradu theses are by default one-sided and don't reset their theorem counter(s) for every
kandi chapter.

For convenience, there's also Finnish equivalents, but they don't imply the language of the thesis.

```

16 \DeclareOption{mscthis}{\uef@mscthisistrue}
17 \DeclareOption{bscthis}{%
18   \uef@mscthisistrue%
19   \uef@twosidefalse%
20   \uef@numbertheoremsbychapterfalse%
21 }
22 \DeclareOption{gradu}{\uef@mscthisistrue}

```



```

23 \DeclareOption{kandi}{%
24   \uef@mscthesisfalse%
25   \uef@twosidefalse%
26   \uef@numbertheoremsbychapterfalse%
27 }

oneside These options allow one to specify one or two sided outlook.
twoside 28 \DeclareOption{oneside}{\uef@twosidefalse}
        29 \DeclareOption{twoside}{\uef@twosidetrue}

polyglossia The polyglossia option activates the polyglossia package. Using it also means
that the document must be compiled with either LuaLATEX or XLATEX.
        30 \DeclareOption{polyglossia}{\uef@polyglossiatrue}

finnish These options control the language of the thesis. Currently only Finnish and
english English (with either US or UK spelling) are supported.
british 31 \DeclareOption{finnish}{\uef@finnishtrue\renewcommand{\uef@language}{finnish}}
        32 \DeclareOption{english}{\uef@finnishfalse\renewcommand{\uef@language}{english}}
        33 \DeclareOption{british}{\uef@finnishfalse\renewcommand{\uef@language}{british}}

osf These options control the way the figures are printed. Option osf turns on old-style
lining figures for text, but not for math or tables. Option lining uses the lining figures.
        34 \DeclareOption{osf}{\uef@osftrue}
        35 \DeclareOption{lining}{\uef@osffalse}

bibtex These options control the way the bibliography is done. Options bibtex and
biblatex biblatex choose between BIBTEX and BIBLATEX, and options numeric and
numeric authoryear choose between numeric and author-year citation format.
authoryear 36 \DeclareOption{bibtex}{\uef@biblatexfalse}
          37 \DeclareOption{biblatex}{\uef@biblatextrue}
          38 \DeclareOption{numeric}{\renewcommand{\uef@biblatexstyle}{numeric-comp}}
          39 \DeclareOption{authoryear}{\renewcommand{\uef@biblatexstyle}{authoryear-comp}}

chaptermathnum These options control the numbering of the mathematical theorem-style en-
runningmathnum vironments, namely theorems, lemmas, corollaries, and propositions. Options
sharedtheoremnumbers chaptermathnum and runningmathnum control whether the counters will re reset
separatetheoremnumbers at the begin of every chapter or not, respectively, while sharedtheoremnumbers
and separatetheoremnumbers control whether all of the environments share a
single counter or if there's a different counter for each environment.
        40 \DeclareOption{chaptermathnum}{\uef@numbertheoremsbychaptertrue}
        41 \DeclareOption{runningmathnum}{\uef@numbertheoremsbychapterfalse}
        42 \DeclareOption{sharedtheoremnumbers}{\uef@singlemathnumbertrue}
        43 \DeclareOption{separatetheoremnumbers}{\uef@singlemathnumberfalse}

hyperref Here we control whether we load the hyperref package and whether we should
nohyperref generate PDF/A format output (by loading the pdfx package). As pdfx loads
pdfa hyperref, we will have to do all setup of hyperref using \hypersetup. We will
nopdfa also make sure that we won't load hyperref if pdfa option is set to true.
        44 \DeclareOption{hyperref}{\uef@hyperreftrue}
        45 \DeclareOption{nohyperref}{\uef@hyperreffalse}
        46 \DeclareOption{pdfa}{\uef@pdfatrue}
        47 \DeclareOption{nopdfa}{\uef@pdfafalse}

```

imlex These settings control whether we use the UEF layout with just the UEF logo (the **uef** default) or UEF layout with IMLEX logos, or use the TUT layout. Very straight forward.

```
48 \DeclareOption{uef}{\uef@imlexfalse\uef@tutfalse}
49 \DeclareOption{imlex}{\uef@imlextrue\uef@tutfalse}
50 \DeclareOption{tut}{\uef@imlexfalse\uef@tuttrue}
```

draft We catch **draft** and **final** options so that we could act on them if we would want **final** to.

```
51 \DeclareOption{draft}{\PassOptionsToClass{\CurrentOption}{book}}
52 \DeclareOption{final}{\PassOptionsToClass{\CurrentOption}{book}}
```

At this point, we can process the options.

```
53 \ProcessOptions\relax
```

This is a convenient point to do some sanity checking and print some info to log for potential debugging etc. TUT layout can only be used with one-sided English MSc theses.

```
54 \ifuef@tut
55 \ifuef@mscthesis\else\ClassError{uefcsthesis}{TUT layout cannot be combined with BSc thesis}
56 \ifuef@twoside\ClassError{uefcsthesis}{TUT layout can only be used with one-sided layout}\fi
57 \ifuef@finnish\ClassError{uefcsthesis}{TUT layout cannot be used with Finnish language}\fi
58 \fi
59 \ifuef@mscthesis
60   \def\@tempa{Master's thesis}
61 \else
62   \def\@tempa{Bachelor's thesis}
63 \fi
64 \ifuef@twoside
65   \def\@tempb{two-sided}
66 \else
67   \def\@tempb{one-sided}
68 \fi
69 \ifuef@osf
70   \def\@tempc{old-style}
71 \else
72   \def\@tempc{lining}
73 \fi
74 \ifuef@tut
75   \def\@tempd{TUT}
76 \else
77   \def\@tempd{UEF}
78 \fi
79 \ifuef@biblatex
80   \ClassInfo{uefcsthesis}{Creating a \@tempa\space in \uef@language . \MessageBreak
81     Using BibLaTeX with style \uef@biblatexstyle .\MessageBreak
82     Layout is \@tempb \@tempd-style \MessageBreak
83     and numbers \@tempc .
84   }
85 \else % BibTeX
86   \ClassInfo{uefcsthesis}{Creating a \@tempa\space in \uef@language . \MessageBreak
87     Using BibTeX with style \uef@biblatexstyle .\MessageBreak
88     Layout is \@tempb \@tempd-style \MessageBreak
89     and numbers \@tempc
```

```

90 }
91 \fi

```

Load the standard book class this class is based on. For TUT layout, we pass 11pt option instead of 12pt option for UEF layout.

```

92 \ifuef@twoside
93   \PassOptionsToClass{twoside}{book}
94 \else
95   \PassOptionsToClass{oneside}{book}
96 \fi
97 \ifuef@tut
98   \LoadClass[a4paper,11pt]{book}
99 \else
100  \LoadClass[a4paper,12pt]{book}
101 \fi

```

4.2 Setting Up the Outlook

We set the page geometry using the `geometry` package. For TUT layout, the geometry is different.

```

102 \ifuef@tut
103 \RequirePackage[a4paper,%
104 top=30mm,%
105 left=20mm,%
106 right=20mm,%
107 bottom=30mm,%
108 head=0pt,%
109 headsep=0pt,%
110 foot=12pt,%
111 footskip=13mm,
112 ]%
113 {geometry}
114 \else
115 \RequirePackage[a4paper,%
116 top=3cm,%
117 left=35mm,%
118 right=30mm,%
119 bottom=20mm,%
120 head=0pt,%
121 headsep=0pt,%
122 foot=12pt,%
123 footskip=13mm,
124 ]%
125 {geometry}
126 \fi

```

`uef@modern` Load some helper packages to identify if we're using a modern version of L^AT_EX (i.e. LuaL^AT_EX or XeL^AT_EX). Save the knowledge at `uef@modern`, so we know it later, and load `inputenc` with UTF-8 encoding and `fontenc` if we're not modern.

```

127 \RequirePackage{ifxetex}
128 \RequirePackage{ifluatex}
129 \RequirePackage{ifthen}
130 \newif\ifuef@modern
131 \ifthenelse{\boolean{xetex}\OR\boolean{luatex}}{\uef@moderntrue}{\uef@modernfalse}

```

```

132 \ifuef@modern
133 \else
134   \RequirePackage[utf8]{inputenc}
135   \RequirePackage[T1]{fontenc}
136 \fi

```

Next, load the font. We use `newtxtext` and `newtxmath`. However, the AMS packages (`amsmath` and `amsthm`) must be loaded before `newtxmath`. We load `amsthm` here, as `newtxmath` loads `amsmath`.

```
137 \RequirePackage{amsthm}
```

If we're using modern engine, we don't load `newtxtext`.

```

138 \ifuef@modern\else
139   \ifuef@osf
140     \RequirePackage[theoremfont,osf]{newtxtext}
141   \else
142     \RequirePackage[theoremfont]{newtxtext}
143   \fi
144 \fi

```

We will also load `textcomp` and `bm` packages to improve math fonts. And we use `varg` argument for `newtxmath` to get more distinguishable g.

```

145 \RequirePackage{textcomp}
146 \RequirePackage[varg]{newtxmath}
147 \RequirePackage{bm}

```

If we're using modern engine, we load TeX Gyre Termes as the font (with or without old style figures, depending on the options).

```

148 \ifuef@modern
149   \RequirePackage[no-math]{fontspec}
150   \ifuef@osf
151     \setmainfont[Numbers=OldStyle]{TeX Gyre Termes}
152   \else
153     \setmainfont{TeX Gyre Termes}
154   \fi
155   \DeclareSymbolFont{operators}{\encodingdefault}{\familydefault}{m}{n}
156 \fi

```

FIXME: doesn't support `newtxmath`'s `theoremfont` option

There is no indent between paragraphs, but there's extra space of 1 em that can be increased to 2 em. The spacing is set to one-and-half using the `setspace` package.

```

157 \setlength{\parindent}{0pt}
158 \setlength{\parskip}{1em \@plus 1em}
159 \RequirePackage[onehalfspacing]{setspace}[2011/12/19]

```

Next we have to load `babel` or `polyglossia` so that we get to set other language-dependant features. But before that, we have to load `csquotes`, that must come before `babel`. We always load Finnish, English, and Swedish as the languages, and set the main language according to the options. Babel must be at least 3.9c to support `main=` definition.

```

160 \RequirePackage{csquotes}
161 \ifuef@polyglossia
162   \RequirePackage{polyglossia}
163   \ifuef@finnish

```

```

164 \setdefaultlanguage{finnish}
165 \setotherlanguages{english,swedish}
166 \else
167 \ifthenelse{\equal{\uef@language}{english}}{%
168 \setdefaultlanguage{english}%
169 }{%
170 \setdefaultlanguage[british]{english}%
171 }
172 \setotherlanguages{finnish,swedish}
173 \fi % \ifuef@finnish
174 \else % using babel
175 \RequirePackage[main=\uef@language,swedish,finnish,english,british]{babel}[2013/04/07]
176 \fi % \ifuef@polyglossia

```

Load the `microtype` package for better typography. Use option ‘final’ to apply `microtype` even when the class is given ‘draft’ option and use option ‘babel’ to turn on babel integration.

```

177 \RequirePackage[final,babel]{microtype}

```

4.3 Headers, Matters, and Appendices

First we need to redefine the chapter header style to write everything in one row. The standard book class calls `\@makechapterhead` to actually print the chapterhead, so we modify that command

```

178 \def\@makechapterhead#1{%
179 \vspace*{50\p@}% some empty space
180 {\parindent \z@ \raggedright \normalfont
181 \interlinepenalty \@M
182 \Huge \bfseries \thechapter. \hspace{1ex} #1\par\nobreak
183 \vskip 40\p@
184 }%
185 }

```

Then we set the page headers using the `fancyhdr` package. In one-sided documents, we put the page number at the middle of the page, but in two-sided documents, we put it to the outer footer.

```

186 \RequirePackage{fancyhdr}
187 \ifuef@twoside
188 \fancypagestyle{plain}{%
189 \fancyhf{}% Clear all
190 \fancyfoot[R0,LE]{\thepage}%
191 }
192 \else
193 \fancypagestyle{plain}{%
194 \fancyhf{}% Clear all
195 \fancyfoot[C]{\thepage}%
196 }
197 \fi

```

And we also make sure that the empty pages are truly empty, and remove the rule between the header and body.

```

198 \fancypagestyle{empty}{\fancyhf{}}
199 \renewcommand{\headrulewidth}{0pt}

```

Front, Main, and Back Matter

`\frontmatter` First redefine `\frontmatter` to have roman numbering and plain pagestyle.

```
200 \renewcommand{\frontmatter}{%
201   \cleardoublepage
202   \pagenumbering{roman}
203   \pagestyle{plain}}
```

`acknowledgements` (*env.*) Frontmatter has the special environments `acknowledgements`, `preface`, and `preface` (*env.*) `acronyms`. These are just unnumbered chapters with pre-defined names.

```
acronyms (env.) 204 \newenvironment{preface}{\chapter*{\uf@s@prefacename}}{}
205 \newenvironment{acknowledgements}{\chapter*{\uf@s@acknowledgementsname}}{}
206 \newenvironment{acronyms}{\chapter*{\uf@s@acronymsname}}{}
207 }
```

The names of `acknowledgements`, `acronyms`, and `preface` sections are defined for Finnish, English, and British.

```
208 \addto\captionsfinnish{\def\uf@s@prefacename{Esipuhe}}
209 \addto\captionsenglish{\def\uf@s@prefacename{Preface}}
210 \addto\captionsbritish{\def\uf@s@prefacename{Preface}}
211 \addto\captionsfinnish{\def\uf@s@acknowledgementsname{Kiitokset}}
212 \addto\captionsenglish{\def\uf@s@acknowledgementsname{Acknowledgments}}
213 \addto\captionsbritish{\def\uf@s@acknowledgementsname{Acknowledgments}}
214 \addto\captionsfinnish{\def\uf@s@acronymsname{Lyhenteet}}
215 \addto\captionsenglish{\def\uf@s@acronymsname{Acronyms}}
216 \addto\captionsbritish{\def\uf@s@acronymsname{Acronyms}}
```

`\mainmatter` Next, the main matter. We use arabic numbers and plain page styles. We also print error if somebody tries to use `\preface` or `\acknowledgements` after `\mainmatter`.

```
217 \renewcommand{\mainmatter}{%
218   \cleardoublepage
219   \pagenumbering{arabic}
220   \pagestyle{plain}
221   \def\preface{\ClassError{ufcsthesis}%
222     {Environment 'preface' can only be used in preface}%
223     {You must put the environment 'preface' before the \MessageBreak
224       \noexpand\mainmatter command.}}
225   \def\acknowledgements{\ClassError{ufcsthesis}%
226     {Environment 'acknowledgements' can only be used in preface}%
227     {You must put the environment 'acknowledgements' before the \MessageBreak
228       \noexpand\mainmatter command.}}
229 }
```

`\backmatter` The `\backmatter` macro is essentially a noop for page style, but it has the important task of defining the label `LastNormalPage`, which will be used in the abstract page to count the number of pages excluding the appendices.

```
230 \renewcommand{\backmatter}{%
231   \label{LastNormalPage}
232   \cleardoublepage
233   \pagestyle{plain}
234 }
```

`appendices` (*env.*) The appendices are written inside the `appendices` environment that is provided by the `appendix` package. We use `titletoc` option to put the appendices to the table

of contents. We also provide the Finnish translation for the strings and re-define the English string for the name of the list of appendices.

```

235 \RequirePackage[titletoc,]{appendix}
236 \ifuef@finnish
237   \renewcommand{\appendixname}{Liite}
238   \renewcommand{\appendixtocname}{Liitteet}
239   \renewcommand{\appendixpagename}{Liitteet}
240 \else
241   \renewcommand{\appendixtocname}{List of appendices}
242 \fi

```

4.4 The Bibliography

We load either `apacite` or `biblatex`, depending on what the user asked with the options. For `biblatex`, we use option `natbib=true` to activate the `natbib`-compatible citation command (`\citet`, `\citep`, etc.), `sorting=nyt` to sort using name-year-title ordering, `sortcites=true` to sort the citations inside one `\cite`-type command, and as a style we use the APA style from `biblatex-apa`. Notice that we need to have the translation of the strings available in file `finnish-apa.lbx`. This file is currently shipped separately with `uefcsthesis.cls`.

`\ifuefbiblatex` We export the internal `\ifuef@biblatex` test as `\ifuefbiblatex` so that it can be used in sample files.

FIXME: Does not honor the `numeric` option. FIXME: The `authoryear-comp` might not be compatible with the `natbib` style

```

243 \newif\ifuefbiblatex\uefbiblatexfalse
244 \ifuef@biblatex
245   \uefbiblatextrue
246   \RequirePackage[natbib=true,
247     sorting=nyt,
248     sortcites=true,
249     style=apa,
250   ]
251   {biblatex}

```

We then update the bibliography name strings

```

252 % Update language-specific strings
253 \DefineBibliographyStrings{english}{%
254   bibliography = {References},
255   references = {References},
256 }
257 \DefineBibliographyStrings{finnish}{%
258   bibliography = {Viitteet},
259   references = {Viitteet},
260 }

```

For `apacite`, we give the `natbibapa` option in order to load the `natbib` package, too.

```

261 \else
262   \RequirePackage[natbibapa]{apacite}
263   \bibliographystyle{apacite}
264   \addto\captionsfinnish{
265     \renewcommand{\bibname}{Viitteet}

```

```

266 }
267 \addto\captionseenglish{
268   \renewcommand{\bibname}{References}
269 }

```

To translate the punctuation correct in Finnish, we must change the `\BCBT` and `\BCBL` that define the comma between two authors and comma between the penultimate and last author, if there's more than two authors, to nothing.

```

270 \addto\captionsefinnish{
271   \renewcommand{\BCBT}{}
272   \renewcommand{\BCBL}{}
273 }
274 \fi % Using BibTeX

```

The `tocbibind` package adds references and other lists of to table of contents. Only works with `BibTeX`; with `BibLaTeX` one has to give option `heading=bibintoc` to `\printbibliography`

```

275 \RequirePackage[nottoc]{tocbibind}

```

4.5 Title and Abstract Pages and Multilingual Support

The macros in this section need to support multi-lingual interface. For consistency, this is done using an optional argument, so that `\title{X}` sets the title in the default language, and `\title[finnish]{X}` sets the title in Finnish (be that the default or not). To implement the optional arguments in a clean way, we use the `xparse` package.

```

276 \RequirePackage{xparse}

```

In principle, `xparse` could cause compatibility issues with older `LaTeX` engines. If that is the case, we could use the following `\ifemptyarg` helper macro `\ifemptyarg`.³

```

\def\ifemptyarg#1{%
  \if\relax\detokenize{#1}\relax % H. Oberdiek
    \expandafter\@firstoftwo
  \else
    \expandafter\@secondoftwo
  \fi%
}

```

The usage of this macro is explained later with the `\setstring` macro.

Macros to Set and Store Thesis Metadata

`\author` Author's name is not multilingual, though, so we don't support any language option here. But we do need to separate author's given and family names; re-define `\@author@family` `\author` to take two arguments and store them in different macros. We also store `\@author` the full name in GivenName FamilyName order to the standard `\@author`.

```

277 \gdef\@author@first{}
278 \gdef\@author@family{}

```

³<https://tex.stackexchange.com/questions/308/different-command-definitions-with-and-without-optional-argument>


```

279 \renewcommand{\author}[2]{\gdef\@author@first{#1}%
280 \gdef\@author@family{#2}%
281 \gdef\@author{#1\space #2}%
282 }

```

`\studentid` Student ID number can be stored using the `\studentid` macro. N.B.! This does not print anything in standard UEF layout, only in TUT layout.

```

283 \def\uef@studentid{\ClassWarning{uefcsthesis}{Student ID is not defined; use \noexpand\studentid}}
284 \newcommand{\studentid}[1]{\def\uef@studentid{#1}}

```

`\uef@supervisor@first` The first supervisor's name is stored in `\uef@supervisor@first`, and we issue a warning if it's not defined.

```

285 \def\uef@supervisor@first{\ClassWarning{uefcsthesis}{First supervisor is not defined}}

```

The second supervisor's name can be left empty, and `\uef@supervisor@second` is only defined if the document calls `\secondsupervisor`.

`\firstsupervisor` Notice that it's possible to call `\secondsupervisor` without calling `\firstsupervisor`, but this is obviously not supported (what would it even mean?)

```

286 \newcommand{\firstsupervisor}[1]{\def\uef@supervisor@first{#1}}
287 \newcommand{\secondsupervisor}[1]{\def\uef@supervisor@second{#1}}

```

`\title` The title of the thesis is set with the standard `\title` macro, and we store its value to the standard `\@title` macro. But we store it in a language-dependant way, so that activating different languages activates the different titles. The optional language parameter has to be saved as a macro so that it's expandable even if it's just a string, like `finnish`. By default, we use the document's main language from `\uef@language`, set by class options.

```

288 \DeclareDocumentCommand{\title}{O{\uef@language} m }{
289 \def\lang{#1}
290 \expandafter\addto\csname captions\lang\endcsname{\def\@title{#2}}
291 }

```

`\subtitle` The (optional) subtitles are handled the same way as the titles. We collect it separately so that we can alter the layout for it and store it in metadata with proper punctuation.

```

292 \DeclareDocumentCommand{\subtitle}{O{\uef@language} m }{
293 \def\lang{#1}
294 \expandafter\addto\csname captions\lang\endcsname{\def\@subtitle{#2}}
295 }

```

`\date` The date of the thesis is stored with the standard `\date` macro, but this is also enhanced to take the optional language parameter.

```

296 \DeclareDocumentCommand{\date}{O{\uef@language} m }{
297 \def\lang{#1}
298 \expandafter\addto\csname captions\lang\endcsname{\def\@date{#2}}
299 }

```

`\uef@year` There is a special macro `\uef@year` that will extract the year from the date (`\@date`), assuming the date is stored in ISO format (YYYY/MM/DD). If not, it simply produces rubbish. The string operations are done using the `xstring` package.

```

300 \RequirePackage{xstring}
301 \def\uef@year{\StrBefore[1]{\@date}{/}}

```

`\today` For TUT layout, we re-define `\today` to produce ISO-formatted date string. This uses the `datetime2` package to set the date format independently of Babel.

```
302 \ifuef@tut
303 \RequirePackage[style=default,datesep=/{]{datetime2}
304 \fi
```

`\thismonth` To print the date of the thesis in the requested format (monthname year), we define a new language-specific macro `\thismonth`. This is saved to `\date<lang>` instead of `\captions<lang>` to be compatible with how `\today` is stored there.

FIXME: Check if the month names could be macros such as Babel's `monthname`, `monthiname`, etc.

```
305 \addto\datefinnish{\def\thismonth{\ifcase \month \or Tammikuu\or Helmikuu\or Maaliskuu\or Hu
306 \addto\dateenglish{\def\thismonth{\ifcase \month \or January\or February\or March\or April\or
307 \addto\datebritish{\def\thismonth{\ifcase \month \or January\or February\or March\or April\or
```

`\keywords` The keywords are added the same way as titles, but we store them twice.

`\uef@keywords` `\uef@keywords` stores the keywords in the current language, while `\uef@all@keywords` stores all keywords given to the `\keywords` macro. This way we can list both Finnish and English keywords, for example. As a consequence, the only way to empty `\uef@all@keywords` is to redefine it to empty.

```
308 \def\uef@keywords{}
309 \def\uef@all@keywords{}
```

`\sep` The keywords must be separated with the `\sep` command. This way they stay compliant with the `pdfx` package, as it assumes keywords to be separated with `\sep`. We will re-define `\sep` to comma for the abstract page, but for other use, we'll use semicolon. `pdfx` will redefine `\sep` for its own needs.

```
310 \protected\def\sep{\leavevmode\unskip ;\space}
```

The actual implementation of `\keywords` is similar to other metadata macros.

```
311 \DeclareDocumentCommand{\keywords}{0}{\uef@language} m }{
312   \def\lang{#1}
313   \expandafter\addto\csname captions\lang\endcsname{\def\uef@keywords{#2}}
314   \ifx\uef@all@keywords\empty
315     \protected@xdef\uef@all@keywords{#2}
316   \else
317     \let\@tempa\uef@all@keywords
318     \protected@xdef\uef@all@keywords{\@tempa \sep #2}
319   \fi
320 }
```

`\city` The `\city` macro is used to set the city of the thesis. This should be either Kuopio or Joensuu (assuming UEF doesn't open new campuses). City is mandatory but easy to forget (unlike title or author name, say), so we complain if it's left empty.

```
321 \def\uef@city{\ClassError{uefcsthesis}%
322   {Thesis city is not defined}%
323   {You must define the city of the thesis (Joensuu or Kuopio)\MessageBreak
324     using \noexpand\city command}}
```

Also, both Kuopio and Joensuu are the same in Finnish and English (and in other Western European languages), so by default, we set the city name to all default

languages (Finnish, English, and British). The optional argument allows for adding new languages or changing the city name for the supported languages.

```

325 \DeclareDocumentCommand{\city}{ o m }{
326   \IfNoValueTF {#1} {
327     \addto\captionsfinnish{\def\uef@city{#2}}
328     \addto\captionsenglish{\def\uef@city{#2}}
329     \addto\captionsbritish{\def\uef@city{#2}}
330   }
331   {
332     \def\lang{#1}
333     \expandafter\addto\csname captions\lang\endcsname{\def\uef@city{#2}}
334   }
335 }

```

FIXME: Make metadata macros print errors if used in document body (`\AtBeginDocument`).

Pre-Defined Strings and a Macro to Change Them

`\setstring` To support the different languages, all pre-defined strings printed are macros that can be changed. The macro to change them is called `\setstring`. If the `xparse` package causes issues, the `\setstring` macro (and the metadata macros above) can be re-defined using the `\ifemptyarg` macro explained above. The non-`xparse` version of `\setstring` could be as follows:

```

\newcommand{\setstring}[3][]{%
  \ifemptyarg{#1}%
  {\set@string{\uef@lang}{#2}{#3}}%
  {\set@string{#1}{#2}{#3}}%
}

```

The `\setstring` macro takes two arguments, the string and the value, and an optional argument, the language (by default, we use the document's default language). The indirection used below is actually not needed, but is left as is to make the above example of non-`xparse` version work.

```

336 \DeclareDocumentCommand \setstring { o m m } {%
337   \IfNoValueTF {#1} {%
338     \set@string {\uef@language} {#2} {#3}%
339   }{%
340     \set@string {#1} {#2} {#3}%
341   }%
342 }

```

`\set@string` The actual string-setting work is done by `\set@string` macro that must have the language parameter. Again, we put the language in a macro to make strings work.

```

343 \newcommand{\set@string}[3]{%
344   \def\lang{#1}

```

All user-editable strings have prefix `uef@s@` to prevent the users to be able to use `\setstring` to set other macros to potentially breaking ways. The string name given to `\setstring` is the macro name without the `uef@s@` prefix.

```

345 \expandafter\addto\csname captions\lang \endcsname{%
346   \expandafter\renewcommand\csname uef@s@#2\endcsname{#3}%

```

```

347 }
348 }

```

We can now define the strings needed for the title and abstract pages. We will index them without the `uef@s@` prefix, that is, in the format given to `\setstring`.

thesistype The thesis type is set based on the class options.

```

349 \ifuef@mscthesis
350 \addto\captionsfinnish{\def\uef@s@thesistype{Pro gradu -tutkielma}}
351 \addto\captionsenglish{\def\uef@s@thesistype{Master's thesis}}
352 \addto\captionsbritish{\def\uef@s@thesistype{Master's thesis}}
353 \else
354 \addto\captionsfinnish{\def\uef@s@thesistype{Kandidaatintutkielma}}
355 \addto\captionsenglish{\def\uef@s@thesistype{Bachelor's thesis}}
356 \addto\captionsbritish{\def\uef@s@thesistype{Bachelor's thesis}}
357 \fi

```

field The field of the thesis is by default CS.

```

358 \addto\captionsfinnish{\def\uef@s@field{Tietojenkäsittelytiede}}
359 \addto\captionsenglish{\def\uef@s@field{Computer Science}}
360 \addto\captionsbritish{\def\uef@s@field{Computer Science}}

```

Currently, to change the thesis field, one has to use the `\setstring` macro. If different fields are needed, there could be a macro to change this (similar to the metadata macros, like `\title`). For slightly more changes, class option could be an option. If there's more changes than just a few strings, it could make more sense to create different class files using DocStrip's conditional extraction capabilities.

departmentname The macros `departmentname`, `facultyname`, and `universityname` store the department's, faculty's, and university's names. Probably mostly useful for theses that need abstract pages in other languages than Finnish and English.

```

361 \addto\captionsfinnish{%
362 \def\uef@s@departmentname{Tietojenkäsittelytieteen laitos}}
363 \addto\captionsenglish{%
364 \def\uef@s@departmentname{School of Computing}}
365 \addto\captionsbritish{%
366 \def\uef@s@departmentname{School of Computing}}
367 \addto\captionsfinnish{%
368 \def\uef@s@facultyname{Luonnontieteiden, metsätieteiden ja tekniikan tiedekunta}}
369 \addto\captionsenglish{%
370 \def\uef@s@facultyname{Faculty of Science, Forestry and Technology}}
371 \addto\captionsbritish{%
372 \def\uef@s@facultyname{Faculty of Science, Forestry and Technology}}
373 \addto\captionsfinnish{%
374 \def\uef@s@universityname{Itä-Suomen yliopisto}}
375 \addto\captionsenglish{%
376 \def\uef@s@universityname{University of Eastern Finland}}
377 \addto\captionsbritish{%
378 \def\uef@s@universityname{University of Eastern Finland}}

```

studyprogramname Macro `studyprogramname` contains the name of the study program; this is only shown with the `imlex` option.

```

379 \addto\captionsfinnish{\def\uef@s@studyprogramname{Master's Programme in Imaging and Light i
380 \addto\captionsenglish{\def\uef@s@studyprogramname{Master's Programme in Imaging and Light i
381 \addto\captionsbritish{\def\uef@s@studyprogramname{Master's Programme in Imaging and Light i

```

The TUT layout does some redefinition of these strings. We use `\uef@s@field` for level and field; department name does not contain “Department of”. Macro `\uef@s@tttitlename` contains the string “Title”, not used in the UEF layout.

```

382 \ifuef@tut
383   \addto\captionsenglish{%
384     \def\uef@s@field{Master of Engineering}}
385   \addto\captionsbritish{%
386     \def\uef@s@field{Master of Engineering}}
387   \addto\captionsenglish{%
388     \def\uef@s@departmentname{Computer Science and Engineering}}
389   \addto\captionsbritish{%
390     \def\uef@s@departmentname{Computer Science and Engineering}}
391   \addto\captionsenglish{%
392     \def\uef@s@universityname{Toyohashi University of Technology}}
393   \addto\captionsbritish{%
394     \def\uef@s@universityname{Toyohashi University of Technology}}
395   \addto\captionsenglish{%
396     \def\uef@s@titlename{Title}}
397   \addto\captionsbritish{%
398     \def\uef@s@titlename{Title}}
399 \fi

```

pages The ever so useful `pages` and `and` strings are needed in many places.

```

and 400 \addto\captionsfinnish{\def\uef@s@pages{s.}}
401 \addto\captionsenglish{\def\uef@s@pages{p.}}
402 \addto\captionsbritish{\def\uef@s@pages{p.}}
403 \addto\captionsfinnish{\def\uef@s@and{ja}}
404 \addto\captionsenglish{\def\uef@s@and{and}}
405 \addto\captionsbritish{\def\uef@s@and{and}}

```

keywordsname And the `keywordsname` string stores the name of the keywords.

```

406 \addto\captionsfinnish{\def\uef@s@keywordsname{Avainsanat}}
407 \addto\captionsenglish{\def\uef@s@keywordsname{Keywords}}
408 \addto\captionsbritish{\def\uef@s@keywordsname{Keywords}}

```

\supervisorname There are different strings for theses with one or many supervisors. (There’s no special support for languages with different plural form for two and three or more cases, but in such cases, one can just re-define `supervisorsname` to the correct case given the number of supervisors.)

\supervisorsname

```

409 \addto\captionsfinnish{\def\uef@s@supervisorname{Ohjaaja}}
410 \addto\captionsenglish{\def\uef@s@supervisorname{Supervisor}}
411 \addto\captionsbritish{\def\uef@s@supervisorname{Supervisor}}
412 \addto\captionsfinnish{\def\uef@s@supervisorsname{Ohjaajat}}
413 \addto\captionsenglish{\def\uef@s@supervisorsname{Supervisors}}
414 \addto\captionsbritish{\def\uef@s@supervisorsname{Supervisors}}

```

app@o The singular and plural versions of the word ‘appendix’ are stored with the `@o` and `@m` suffices. Hence, to change them inside the main document, one has to use `\makeatletter` and `\makeatother`. This could perhaps be changed in the future.

```

app@m 415 \addto\captionsfinnish{\def\uef@s@app@o{liite}\def\uef@s@app@m{liitettä}}
416 \addto\captionsenglish{\def\uef@s@app@o{appendix}\def\uef@s@app@m{appendices}}
417 \addto\captionsbritish{\def\uef@s@app@o{appendix}\def\uef@s@app@m{appendices}}

```

`\ccsname` The name of the ACM Computing Classification is given in a fixed string `\ccsname` with no way to change it. As the classification itself is always in English, this should suffice.

```
418 \def\ccsname{ACM CCS (2012)}
```

`\uef@logo` The name of the file containing the university logo is not a string, and hence it's not prefixed with `uef@s@`. To change it, one has to redefine `\uef@logo`. To show the logo, we load the `graphicx` package. If this is IMLEX thesis, we use the collected IMLEX logos.

```
419 \ifuef@imlex
420 \def\uef@logo{imlex_logos}
421 \else
422 \def\uef@logo{uef_logo}
423 \fi
424 \RequirePackage{graphicx}
```

Title and Abstract Pages

Final thing before we can define the title and abstract pages is to define a helper macro⁴ `\uef@selectlanguage`.

`\uef@selectlanguage` This is used to solve the problem that `babel` assumes that the language parameter given to `\selectlanguage` is a language name (e.g. `\selectlanguage{\english}` is equivalent to `\selectlanguage{english}`). As we need to pass the language name in a macro, we need to make sure it gets expanded before calling `\selectlanguage`.

```
425 \ifuef@polyglossia
426 \let\uef@selectlanguage=\selectlanguage

polyglossia doesn't allow macros as language names, and hence will expand the
parameter correctly.

427 \else
428 \newcommand{\uef@selectlanguage}[1]{%
429   \begingroup\edef\x{\endgroup
430     \noexpand\selectlanguage{#1}}\x
431 }
432 \fi
```

`\maketitle` The `\maketitle` macro will just set up the title page using the standard `titlepage` environment from the `book` class. We will turn off the page anchors for the title page. The `\hypersetup` command is guaranteed to exist.

```
433 \renewcommand{\maketitle}{%
434   \hypersetup{pageanchor=false}
435   \begin{titlepage}%
```

We make sure the language is the document's main language, otherwise the title page will look wrong.

```
436   \uef@selectlanguage{\uef@language}
```

⁴<https://tex.stackexchange.com/questions/136659/how-to-pass-a-macro-as-the-argument-to-selectlanguage>

For the title, we leave some space at the top, center everything, and set the title in `\LARGE` font and the subtitle, if it's given, in `\Large` font.

```

437 \null\vspace{0.5cm}
438 \begin{center}
439 {\LARGE \@title \par}
440 \ifdefined\@subtitle
441 {\Large \@subtitle \par}
442 \fi

```

There's 1.5 cm between the author and the title.

```

443 \vspace{1.5cm}
444 {\large \@author \par}

```

And thesis type, university logo, affiliation info, and date are pushed to the bottom of the page. If we show the IMLEX logos, they go to the bottom of the page; otherwise, the UEF logo comes above the department name, field, and date. `imlex` setting also shows the study program name below the thesis level and replaces the field name with the university name.

```

445 \vfill
446 {\large \uef@s@thesistype\\
447 \ifuef@imlex
448 \uef@s@studyprogramname\\
449 \else
450 \vspace{1em}
451 \includegraphics[height=7cm]{\uef@logo}\\
452 \fi
453 \uef@s@departmentname\\
454 \ifuef@imlex
455 \uef@s@universityname\\
456 \else
457 \uef@s@field\\
458 \fi
459 \@date \par}
460 \ifuef@imlex
461 \includegraphics[width=\textwidth]{\uef@logo}\par
462 \fi
463 \end{center}
464 \end{titlepage}%
465 \hypersetup{pageanchor=true}
466 }

```

The TUT layout title page is done differently.

```

467 \ifuef@tut
468 \renewcommand{\maketitle}{%
469 \hypersetup{pageanchor=false}
470 \begin{titlepage}%
471 \uef@selectlanguage{\uef@language}

```

For the TUT style, we leave 30 mm from top, center everything, and set the title in `\Large` font and the subtitle, if it's given, in `\large` font.

```

472 \null\vspace{30mm}
473 \begin{center}
474 {\Large \@title \par}
475 \ifdefined\@subtitle
476 {\Large \@subtitle \par}

```

```

477      \fi
There's 37 mm between the title and the year.
478      \vspace{37mm}
479      {\large \uef@year \par}
There's 11 mm between the year and the field and another 11 mm between field
and departmentname
480      \vspace{11mm}
481      {\large \MakeUppercase{\uef@s@field} \par}
482      \vspace{11mm}
483      {\large Department~of~\MakeUppercase{\uef@s@departmentname} \par}
The distance between department name and student name is flexible. Student's
name is 7 mm from student ID, which is 20 mm from university name (in all-caps).
484      \vspace{\fill}
485      {\large \@author\\[7mm]
486      \uef@studentid\\[20mm]
487      \MakeUppercase{\uef@s@universityname} \par}
488      \vspace{10mm}
489      \end{center}
490      \end{titlepage}%
491      \hypersetup{pageanchor=true}
492  }
493  \fi

```

To print the information on the abstract page, we define some helper macros.

`\numberofappendices` Currently, the number of appendices (if any) and the number of pages they have
`\appendixpagecount` must be specified manually. This option is good to have even if some future
`uef@appendixcounter` implementation allows automatically figuring this information from the L^AT_EX
`uef@appendixpages` sources, as students might have to add appendices directly to the final PDF.

```

494 \newcounter{uef@appendixcounter}
495 \newcounter{uef@appendixpages}
496 \newcommand{\numberofappendices}[1]{\setcounter{uef@appendixcounter}{#1}}
497 \newcommand{\appendixpagecount}[1]{\setcounter{uef@appendixpages}{#1}}

```

`\uef@printappendixpagenumbers` The number of appendices, and their total page count, is printed with the
`\uef@printappendixpagenumbers` helper macro.

```

498 \def\uef@printappendixpagenumbers{%
499   \ifnum\value{uef@appendixcounter}>0
500     ,\space
501     \ifcase\value{uef@appendixcounter}\relax

```

The counter `uef@appendixcounter` cannot be zero, as we just checked against it.
If it's one, use string `\uef@s@app@o`; otherwise, use string `\uef@s@app@m`.

```

502   \or%
503     \arabic{uef@appendixcounter}~\uef@s@app@o%
504   \else
505     \arabic{uef@appendixcounter}~\uef@s@app@m%
506   \fi

```

The total number of appendix pages comes in parentheses. We assume that the
string `\uef@s@pages` doesn't have to differentiate between one and many pages.

```

507   \space (\arabic{uef@appendixpages}~\uef@s@pages)

```



```

508 \fi
509 }

```

`\uef@printsupervisors` The name(s) of the supervisor are printed by `\uef@printsupervisors`. The macro checks whether there are one or two supervisors by testing if `\uef@supervisor@second` is undefined or not. To have more than two supervisors, all but the last supervisor should be listed in `\uef@supervisor@first` and the list should end with comma if thesis is in English and uses Oxford comma.

```

510 \newcommand{\uef@printsupervisors}%
511 {\@ifundefined{uef@supervisor@second}%
512  {\uef@s@supervisorname :\space \uef@supervisor@first}%
513  {\uef@s@supervisorsname :\space \uef@supervisor@first\space%
514   \uef@s@and\space\uef@supervisor@second}%
515 }

```

`\ccsdesc` The ACM CCS 2012 web tool⁵ generates L^AT_EX code with command `\ccsdesc`. The `\@concepts` code to parse it, below, is copied directly from the `acmart.cls` file (2022/05/10, v1.85), by Boris Veytsman. It uses the `comment` package to make L^AT_EX to ignore the XML that is printed first. In the future, this script could add the classification terms to the PDF metadata. The parsed concepts with the correct typesetting is stored in the `\@concepts` macro, which we will use later in the `abstract` environment.

```

516 \RequirePackage{comment}
517 \excludecomment{CCSXML}
518 \let\@concepts\@empty
519 \newcounter{@concepts}
520 \newcommand\ccsdesc[2][100]{%
521  \ccsdesc@parse#1~#2~~\ccsdesc@parse@end}
522 \def\textrightarrow{$\rightarrow$}
523 \def\ccsdesc@parse#1~#2~#3~{%
524  \stepcounter{@concepts}%
525  \expandafter\ifx\csname CCS@General@#2\endcsname\relax
526   \expandafter\gdef\csname CCS@General@#2\endcsname{\textbullet\
527    \textbf{#2}}}%
528   \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{; }%
529   \expandafter\gdef\csname CCS@Specific@#2\endcsname{}%
530   \g@addto@macro{\@concepts}{\csname CCS@General@#2\endcsname
531    \csname CCS@Punctuation@#2\endcsname
532    \csname CCS@Specific@#2\endcsname}%
533   \fi
534   \ifx#3\relax\relax\else
535   \expandafter\gdef\csname CCS@Punctuation@#2\endcsname{
536    \textrightarrow\ }%
537   \expandafter\g@addto@macro\expandafter{\csname CCS@Specific@#2\endcsname}{%
538    \addtocounter{@concepts}{-1}%
539    \ifnum#1>499\textbf{#3}\else
540    \ifnum#1>299\textit{#3}\else
541    #3\fi\fi\ifnum\value{@concepts}=0.\else; \fi}%
542   \fi
543   \ccsdesc@parse@finish}
544 \def\ccsdesc@parse@finish#1\ccsdesc@parse@end{}

```

⁵<https://dl.acm.org/ccs/ccs.cfm>

abstract (*env.*) The abstract(s) are enclosed in the **abstract** environment that will print the whole abstract page. The environment takes the language of the page as an optional argument; if no argument is given, it uses the document default language.

```
545 \newenvironment{abstract}[1][\uef@language]{%
```

Like **\maketitle**, the **abstract** environment also uses the **titlepage** environment from the **book** class. We use the raw **\titlepage** and **\endtitlepage** commands so that the error messages report the **abstract** environment and not the (unknownst to the user) **titlepage** environment. Also similarly to **\maketitle**, we turn off the page anchors.

```
546 \hypersetup{pageanchor=false}
547 \titlepage
```

We set the language to the provided one (or the default), and set the spacing to single.

```
548 \uef@selectlanguage{#1}
549 \singlespacing
```

The university name is printed in all-caps. To make them look a bit better, we use large small caps. Alternatively, some kerning could be used to set the name properly in all-caps. Faculty and department info and thesis field follow. With **imlex**, faculty and city are in a row of their own and the field name is replaced with the study program name.

```
550 \textsc{\large\MakeLowercase{\uef@s@universityname}}\ifuef@imlex \\else ,\space\fi
551 \uef@s@facultyname\\
552 \uef@city\\
553 \uef@s@departmentname\\
554 \ifuef@imlex
555 \uef@s@studyprogramname
556 \else
557 \uef@s@field
558 \fi\\[2em]
```

In the abstract page, the author name is printed in FamilyName, GivenName order and the author name is separated from the title with a colon. If subtitle is given, it's separated from the main title with an en-dash and spaces.

```
559 \@author@family , \@author@first : \@title
560 \ifdefined\@subtitle\space -- \@subtitle\fi\\
```

We count the number of pages automatically from **\mainmatter** to **\backmatter** using **LastNormalPage** label. The appendix information is printed if needed.

```
561 \uef@s@thesistype ,\space \pageref{LastNormalPage}~\uef@s@pages %
562 \uef@printappendixpagenumbers\\
```

Finally, we print the supervisor(s) name(s) and date and begin the abstract with boldface text saying 'abstract' in the correct language.

```
563 \uef@printsupervisors\\
564 \@date \par
565 \paragraph{\abstractname :}
566 }%
```

At the end of the abstract page, we'll print the keywords with a header that is always printed, as the keywords are mandatory. If the CCS concepts are defined, we'll also print them. Finally, we'll close the **titlepage** environment.

```
567 {\vspace{2em}}
```

```

568 \paragraph{\uef@s@keywordsname :} \uef@keywords\par
569 \ifx\@concepts\empty\else\bgroup
570   {\paragraph{\ccsname}\mbox{}\}\ \@concepts\par }\egroup
571 \fi
572 \endtitlepage
573 \hypersetup{pageanchor=true}}

```

For TUT layout, we need to define the abstract in a very different way.

\uef@abstractstrut First we need some struts to make the boxes the right height. The numbers here
\uef@@abstractstrut are determined by trial and error.

```

\uef@@@abstractstrut 574 \ifuef@tut
575 \RequirePackage{mdframed}
576 \def\uef@abstractstrut{\rule[-4mm]{0pt}{9mm}}
577 \def\uef@@abstractstrut{\rule[-7mm]{0pt}{15mm}}
578 \def\uef@@@abstractstrut{\rule[-9mm]{0pt}{19mm}}

```

The actual abstract starts the same way as the UEF one.

```

579 \renewenvironment{abstract}[1][\uef@language]{%
580   \hypersetup{pageanchor=false}
581   \titlepage
582   \uef@selectlanguage{#1}
583   \singlespacing

```

First we set date to top-right corner and underline it. It appears in the header, which is done with a manual move.

```

584 \null\vspace*{-15mm}\par
585 \hfill\underline{DATE~::~\@date\hspace*{2cm}}\par

```

Next comes series of boxes, done here as tables.

```

586 \vspace{5mm}
587 \begin{tabular}{@{}|>{\centering\arraybackslash}m{20mm}|c|@{}>{\centering\arraybackslash}m{7
588   \hline \multicolumn{2}{|m{83mm}@{}|}{\uef@abstractstrut Department~of~\uef@s@departmentnam
589   \hline
590   \uef@abstractstrut Name & \multicolumn{3}{l|}{\uef@abstractstrut\@author} \\\
591   \hline
592 \end{tabular}
593 \hspace{5mm}
594 \begin{tabular}{@{}|>{\centering\arraybackslash}m{15.5mm}|@{}>{\centering\arraybackslash}m{3
595   \hline
596   \uef@@@abstractstrut\uef@s@supervisorname & \uef@@@abstractstrut\uef@supervisor@first\\
597   \hline
598 \end{tabular}\par

```

The actual abstract starts with one more table.

```

599 \vspace{5mm}
600 \begin{tabular}{|@{}>{\centering\arraybackslash}m{0.2\textwidth}@{}|@{}m{0.79\textwidth}@{}|
601   \multicolumn{2}{>{\centering\arraybackslash}p{.976\textwidth}}{\abstractname} \\\
602   \hline
603   \uef@@@abstractstrut\uef@s@titlename & \@title \\\
604   \hline
605 \end{tabular}\par

```

And the text of the abstract is put inside a framed box. This uses the mdframed package to create a framed environment.

```

606 \vspace{5mm}

```

```

607 \begin{mdframed}[innerleftmargin=5pt,innerrightmargin=5pt]%
608 \begin{minipage}[t][\dimexpr\pagegoal-\pagetotal-\baselineskip-10pt][t]{\dimexpr\linewidth-1
609 }%

```

The end of the abstract page is very straight forward.

```

610 {%
611 \end{minipage}%
612 \end{mdframed}%
613 \endtitlepage
614 \hypersetup{pageanchor=true}}
615 \fi

```

4.6 Commands for Mathematics

The main thing we need to do to support math is to provide the theorem-like environments in different languages and with different numbering options. Also, the class defines few conveniency macros for typesetting math properly.

Theorem-Like Environments

```

theoremname We start by defining the theorem-like names in a way that supports babel and
lemmaname polyglossia. These have the same \def\@s@ prefix as with other strings, and they
corollaryname can be changed, and new languages can be added, with the \setstring macro.
propositionname 616 \addto\captionsfinnish{\def\@s@theoremname{Lause}}
conjecturename 617 \addto\captionsenglish{\def\@s@theoremname{Theorem}}
definitionname 618 \addto\captionsbritish{\def\@s@theoremname{Theorem}}

problemname Here we use the term ‘Lause’ for Theorem in Finnish. Some authors prefer
examplename ‘Teoreema’, but this can be changed with \setstring{theoremname}{Teoreema}
remarkname in Finnish theses.
notename
619 \addto\captionsfinnish{\def\@s@lemmaname{Lemma}}
620 \addto\captionsenglish{\def\@s@lemmaname{Lemma}}
621 \addto\captionsbritish{\def\@s@lemmaname{Lemma}}
622 \addto\captionsfinnish{\def\@s@corollaryname{Korollari}}
623 \addto\captionsenglish{\def\@s@corollaryname{Corollary}}
624 \addto\captionsbritish{\def\@s@corollaryname{Corollary}}
625 \addto\captionsfinnish{\def\@s@propositionname{Propositio}}
626 \addto\captionsenglish{\def\@s@propositionname{Proposition}}
627 \addto\captionsbritish{\def\@s@propositionname{Proposition}}
628 \addto\captionsfinnish{\def\@s@conjecturename{Konjektuuri}}
629 \addto\captionsenglish{\def\@s@conjecturename{Conjecture}}
630 \addto\captionsbritish{\def\@s@conjecturename{Conjecture}}
631 \addto\captionsfinnish{\def\@s@definitionname{Määritelmä}}
632 \addto\captionsenglish{\def\@s@definitionname{Definition}}
633 \addto\captionsbritish{\def\@s@definitionname{Definition}}
634 \addto\captionsfinnish{\def\@s@problemname{Ongelma}}
635 \addto\captionsenglish{\def\@s@problemname{Problem}}
636 \addto\captionsbritish{\def\@s@problemname{Problem}}
637 \addto\captionsfinnish{\def\@s@examplename{Esimerkki}}
638 \addto\captionsenglish{\def\@s@examplename{Example}}
639 \addto\captionsbritish{\def\@s@examplename{Example}}
640 \addto\captionsfinnish{\def\@s@remarkname{Huomautus}}
641 \addto\captionsenglish{\def\@s@remarkname{Remark}}
642 \addto\captionsbritish{\def\@s@remarkname{Remark}}

```

```

643 \addto\captionsfinnish{\def\uef@s@notename{Merkintä}}
644 \addto\captionsenglish{\def\uef@s@notename{Note}}
645 \addto\captionsbritish{\def\uef@s@notename{Note}}

```

The remaining definitions were straight forward.

Now we can define the theorem-like environments. This uses the `amsthm` package, included before the font was loaded. Theorems, Lemmas, Corollaries, Propositions, and Conjectures are in the ‘plain’ theorem style.

```

646 \theoremstyle{plain}

```

theorem (*env.*) We will first define `theorem`, and set it to reset with the chapter counter or not, depending on the class options.

```

647 \ifuef@numbertheoremsbychapter
648   \newtheorem{theorem}{\uef@s@theoremname}[chapter]
649 \else
650   \newtheorem{theorem}{\uef@s@theoremname}
651 \fi

```

lemma (*env.*) The remaining plain-style environments either follow `theorem`’s numbering or not,

corollary (*env.*) depending on class options.

```

proposition (env.) 652 \ifuef@singlemathnumber
conjecture (env.) 653   \newtheorem{lemma}{theorem}{\uef@s@lemmaname}
654   \newtheorem{corollary}{theorem}{\uef@s@corollaryname}
655   \newtheorem{proposition}{theorem}{\uef@s@propositionname}
656   \newtheorem{conjecture}{theorem}{\uef@s@conjecturename}
657 \else
658   \newtheorem{lemma}{\uef@s@lemmaname}
659   \newtheorem{corollary}{\uef@s@corollaryname}
660   \newtheorem{proposition}{\uef@s@propositionname}
661   \newtheorem{conjecture}{\uef@s@conjecturename}
662 \fi

```

cor (*env.*) Some lazy authors don’t want to write `corollary` or `proposition`, so we let the **prop** (*env.*) short versions `cor` and `prop` to be aliases by re-defining the low-level commands.

```

663 \let\cor\corollary \let\endcor\endcorollary
664 \let\prop\proposition \let\endprop\endproposition

```

Environments for definitions, problems, and examples use the ‘definition’ theorem style.

```

665 \theoremstyle{definition}

```

definition (*env.*) Again, the numbers either follow `chapter` or not, depending on the class options.

```

problem (env.) 666 \ifuef@numbertheoremsbychapter
example (env.) 667   \newtheorem{definition}{\uef@s@definitionname}[chapter]
668   \newtheorem{problem}{\uef@s@problemname}[chapter]
669   \newtheorem{example}{\uef@s@examplename}[chapter]
670 \else
671   \newtheorem{definition}{\uef@s@definitionname}
672   \newtheorem{problem}{\uef@s@problemname}
673   \newtheorem{example}{\uef@s@examplename}
674 \fi%

```

`remark (env.)` Finally, `remark` and `note` use the ‘`remark`’ style and have no numbers.

```
note (env.) 675 \theoremstyle{remark}
            676 \newtheorem*{remark}{\uef@s@remarkname}
            677 \newtheorem*{note}{\uef@s@notename}
```

By default, equation numbers are of form (ch.eq), where `ch` is the chapter number and `eq` is the equation number within the chapter. This is the correct use when numbering theorems by chapter and we don’t have to do anything.

```
678 \ifuef@numbertheoremsbychapter%
679 \else
```

If the user has requested the numbering to not reset with chapters (explicitly or implicitly because this is a Bachelor’s thesis), we have to turn that feature off from equations, as well. To do that, we use the `chngcntr` packages.

```
680 \RequirePackage{chngcntr}
681 \counterwithout{equation}{chapter}
682 \fi
```

Conveniency Macros

The `amsmath` package defines the vertical-bar-as-parenthesis operators `\lvert` and `\rvert` and their double-bar versions `\lVert` and `\rVert`.

`\abs` We use the `mathtools` package to provide the conveniency macros `\abs` and `\norm`

```
\norm 683 \RequirePackage{mathtools}
        684 \DeclarePairedDelimiter\abs{\lvert}{\rvert}
        685 \DeclarePairedDelimiter\norm{\lVert}{\rVert}
```

The ISO 31-11:1992 standard defines that open and half-open intervals can be typeset either as (a, b) , $(a, b]$, and $[a, b)$ or as $]a, b[$, $]a, b]$, and $[a, b[$. To support the latter notation with correct spacing (note that the spacing here is *not* correct), we have to declare ‘`]`’ and ‘`[`’ as left and right parenthesis symbols, respectively.

`\lOpen` We store the symbols as math delimiters `\lOpen` and `\rOpen`.

```
\rOpen 686 \DeclareMathDelimiter{\lOpen}{\mathopen}{operators}{93}{largesymbols}{3}
        687 \DeclareMathDelimiter{\rOpen}{\mathclose}{operators}{91}{largesymbols}{2}
```

`\lointerval` To facilitate the use of the ‘inverted brackets’ notation, we provide macros for
`\rointerval` left-open, right-open, and open intervals as `\lointerval`, `\rointerval`, and
`\ointerval` `\ointerval`, respectively.

```
688 \DeclarePairedDelimiter\lointerval{\lOpen}{\rbrack}
689 \DeclarePairedDelimiter\rointerval{\lbrack}{\rOpen}
690 \DeclarePairedDelimiter\ointerval{\lOpen}{\rOpen}
```

4.7 Support for Other Packages

The class also supports some other often-used packages. Some of them are pre-loaded (usually to encourage their use), and for others, the support usually means translated strings.

Captions and Tables

We load the `caption` package to customize the outlook of the captions. Namely, the figure captions should be at the bottom, table captions should at the top, and the label (e.g. ‘Figure 1’ should be set in bold.

```
691 \RequirePackage[%  
692   figureposition=bottom,%  
693   tableposition=top,%  
694   labelfont=bf,%  
695 ]{caption}
```

For tables, we load the `booktabs` package , because nobody should make any tables without it,

```
696 \RequirePackage{booktabs}
```

and the `tabularx` package that allows for stretchable `p`-type columns denoted `X`.

```
697 \RequirePackage{array}  
698 \RequirePackage{tabularx}
```

The `tabularx` package loads the `array` package, but we load it explicitly to indicate that we use its `\newcolumntype` to define centered, left-aligned, and right-aligned math columns `C`, `L`, and `R`.

```
699 \newcolumntype{C}{>{$}c<{$}}  
700 \newcolumntype{L}{>{$}l<{$}}  
701 \newcolumntype{R}{>{$}r<{$}}
```

Typesetting Algorithms

The class supports the two most popular pseudocode packages, `algorithm2e` and `algorithmicx`, as well as the `listings` package. We don’t load them, but we define the necessary strings in `babel` and `polyglossia`.

In `algorithm2e`, the two strings we define are `\algorithmcfname` (the word ‘Algorithm’ in the label) and `\litalgorithmcfname` (the title for the list of algorithms, if used).

```
702 \addto\captionsfinnish{\def\algorithmcfname{Algoritmi}}  
703 \addto\captionsenglish{\def\algorithmcfname{Algorithm}}  
704 \addto\captionsbritish{\def\algorithmcfname{Algorithm}}  
705 \addto\captionsfinnish{\def\litalgorithmcfname{Algoritmiluetelo}}  
706 \addto\captionsenglish{\def\litalgorithmcfname{List of Algorithms}}  
707 \addto\captionsbritish{\def\litalgorithmcfname{List of Algorithms}}
```

The `algorithmicx` package uses the `algorithms` bundle to generate the floating `algorithm` environment. The `algorithms` bundle again uses the `float` package, which allows us to change the name of the float with `\floatname{<floatenv>}{<name>}` command. To avoid having to check if `float` is loaded, we provide a dummy command:

```
708 \providecommand{\floatname}[2]{}%
```

The name of the floating environment is `algorithm`, which we re-define using the `\floatname`. The ‘list of algorithms’ name is `\litalgorithmname`.

```
709 \addto\captionsfinnish{\floatname{algorithm}{Algoritmi}}  
710 \addto\captionsenglish{\floatname{algorithm}{Algorithm}}  
711 \addto\captionsbritish{\floatname{algorithm}{Algorithm}}  
712 \addto\captionsfinnish{\def\litalgorithmname{Algoritmiluetelo}}
```

```

713 \addto\captionsenglish{\def\listalgorithmname{List of Algorithms}}
714 \addto\captionsbritish{\def\listalgorithmname{List of Algorithms}}

```

In listings (and listingsutf8), the two strings we define are `\lstlistingname` and `\lstlistlistingname`.

```

715 \addto\captionsfinnish{\def\lstlistingname{Listaus}}
716 \addto\captionsenglish{\def\lstlistingname{Listing}}
717 \addto\captionsbritish{\def\lstlistingname{Listing}}
718 \addto\captionsfinnish{\def\lstlistlistingname{Listausluettelo}}
719 \addto\captionsenglish{\def\lstlistlistingname{List of Listings}}
720 \addto\captionsbritish{\def\lstlistlistingname{List of Listings}}

```

4.8 PDF/A and Hyperlink Support

The PDF metadata is collected at the end of the preamble, so that the user has had time to fill it in. We use the `etoolbox` package for the `\AtEndPreamble`. The metadata commands must be defined before loading `pdfx` or `hyperref`. The correctly-formatted metadata is stored in special macros that start `uef@pdf@`.

```

721 \RequirePackage{etoolbox}
722 \AtEndPreamble{

```

`\uef@pdf@title` We separate the subtitle, if given, with standard hyphen in metadata.

```

723 \ifdefined\@subtitle
724   \def\uef@pdf@title{\@title{} - \@subtitle}
725 \else
726   \def\uef@pdf@title{\@title}
727 \fi

```

`\uef@pdf@author` Author's name should always be defined, but just in case, we check for it, and store the name in Family, First order.

```

728 \ifdefined\@author@first
729   \def\uef@pdf@author{\@author@family , \@author@first}
730 \else
731   \def\uef@pdf@author{}
732 \fi

```

`\uef@pdf@subject` The PDF subject metadata field is somewhat vague. We store the thesis type, it's field, and the name of the university and the faculty. We could also store the CCS classification, but currently we don't do that.

```

733 \def\uef@pdf@subject{\uef@s@thesistype, %
734   \uef@s@field. \uef@s@universityname, %
735   \uef@s@facultyname}
736 }

```

Sample .xpmdata File

The package reads XMP metadata from a file called `\jobname.xmpdata`. For most use cases of `uefcsthesis`, this file can simply direct to the above-defined macros.

```

737 </cs>
738 <*xmp>
739 \Title{\uef@pdf@title}
740 \Author{\@author}

```


The `pdfx` package puts the contents of the `\Keywords` macro in `XMP-dc:Subject` field, and the contents of the `\Subject` macro in `XMP-dc:Description` field.⁶

```
741 \Keywords{\uef@keywords}
742 \Subject{\uef@pdf@subject}
```

As the publisher, we use just the university, as is common with theses.

```
743 \Publisher{\uef@s@universityname}
744 \xmp
745 \*cs
```

If the author has used complicated macros (or math) in `\author`, `\title`, or `\keywords`, this system might fail. In such situations, the author should edit the `\jobname.xmpdata` file manually.

Loading the Packages

If the user has requested the generation of the PDF/A file, we load the `pdfx` package at the end of the preamble. That way we know that we have the metadata defined before. `pdfx` requires file called `\jobname.xmpdata`, and our default file uses the above `uef@pdf@` strings to fill in the metadata. We set the type of the PDF as PDF/A-1b. Using the 2b version would be better, as it supports layered figures, but alas, the fonts are not entirely compatible (they do not define all CID's). Also, we will make sure the language is the correct one so that we get the right extensions of the macros.

The `colorprofiles` package is loaded by `pdfx`, but `MiKTeX` doesn't download the package unless we specifically ask for it and `pdfx` only loads it if it exists. We also set the minimum version of `pdfx` to rather recent, and set the `pdfstartview` option of `hyperref` to empty. For these, see also <https://coursepages.uta.fi/mtta1-latex/wp-content/uploads/sites/55/2019/03/pdfa-guide.pdf>.

```
746 \ifuef@pdfa
747   \AtEndPreamble{%
748     \uef@selectlanguage{\uef@language}%
749     \RequirePackage{colorprofiles}
750     \RequirePackage[a-1b,mathxmp]{pdfx}[2018/12/22]%
751     \hypersetup{pdfstartview=}
752   }
753 \fi
```

If user did not request PDF/A, we load `hyperref` (`pdfx` loads it otherwise). `hyperref` should always be loaded at the very end, and in case there are any problems, it's loading here can be prevented.

```
754 \ifuef@hyperref
755 \ifuef@pdfa\else
756   \RequirePackage{hyperref}
```

If loaded, `pdfx` will set the PDF metadata. Here, we set it using `hyperref` as `pdfx` hasn't been loaded.

```
757 \AtBeginDocument{
758   \let\oldsep\sep
759   \def\sep{, \space}
760   \hypersetup{pdfauthor={\uef@pdf@author},
761     pdftitle={\uef@pdf@title},
```

⁶For more information, see <http://www.dublincore.org/documents/dces/>.

```

762 pdfkeywords={\uef@all@keywords},
763 pdfsubject={\uef@pdf@subject}
764 }
765 \let\sep\oldsep
766 }%
767 \fi\fi % \ifhyperref\ifpdfa

```

`\hypersetup` We use the `\hypersetup` command in the title and abstract pages without checking that it exists, so to be safe, we provide a dummy command that does nothing if `\hyperref` is not loaded.

```

768 \providecommand{\hypersetup}[1]{}

```

4.9 Last Bit

The very last thing to do is to turn the `pagestyle` to empty and end with `DocStrip`.

```

769 \pagestyle{empty}
770 \</cs>

```

4.10 Minimal Example Files

This section contains the sources for the minimal example files. We generate five files, four for all combinations of

$$\{\text{classic, modern}\} \times \{\text{English, Finnish}\}$$

and one with `{modern, English, imlex}` and both `classic` and `modern` with `English` and `tut`.

These examples are all protected with the `ex` quard

```

771 \<*ex>

```

We primarily divide by language, starting with English.

```

772 \<*en>
773 %% This is a minimal example of using the uefcstthesis class.
774 %% This generates an English MSc thesis with one-sided layout.

```

The command to use to compile and the `\documentclass` command depend on the engine.

```

775 \<*modern>
776 %% To compile, use either lualatex or xelatex, for example,
777 %% $ lualatex minimal_modern.en.tex
778 %% $ biber minimal_modern.en
779 %% $ lualatex minimal_modern.en.tex
780 %% or use latexmk:
781 %% $ latexmk -lualatex minimal_modern.en.tex
782 %%
783 %% When returning the final thesis to library, you must also return the source code
784 %% used to create the final version. This is easiest if you flatten your document into
785 %% a single file (+ image files). To do that, use can use latexexpand (see
786 %% https://www.ctan.org/pkg/latexexpand), which is also part of TeX Live and
787 %% MiKTeX packages. An example use of latexexpand would be
788 %% $ lualatex minimal_modern.en.tex
789 %% $ biber minimal_modern.en
790 %% $ latexexpand --empty-comments --biber minimal_modern.en.bbl \

```

```

791 %% > minimal_modern.en.tex > flat_thesis.tex
792 %% $ lualatex flat_thesis
793 %% $ lualatex flat_thesis
794 %% which produces files called flat_thesis.tex and flat_thesis.pdf that can be
795 %% returned to the library.
796 %%
797 \ltxclass[mscthesis,english,oneside,biblatex]{uefcstthesis}
798 \ltxclass[mscthesis,english,oneside,biblatex,imlex]{uefcstthesis}
799 \ltxclass[mscthesis,english,oneside,biblatex,tut]{uefcstthesis}
800 %% Correct the below with the name of your bibliography file
801 \addbibresource{minimal.bib}
802 \modern
803 \classic
804 %% To compile, use pdflatex, for example,
805 %% $ pdflatex minimal_classic.en.tex
806 %% $ bibtex minimal_classic.en
807 %% $ pdflatex minimal_classic.en.tex
808 %% or use latexmk:
809 %% $ latexmk -pdf minimal_classic.en.tex
810 %%
811 %% When returning the final thesis to library, you must also return the source code
812 %% used to create the final version. This is easiest if you flatten your document into
813 %% a single file (+ image files). To do that, use can use latexexpand (see
814 %% https://www.ctan.org/pkg/latexexpand), which is also part of TeX Live and
815 %% MiKTeX packages. An example use of latexexpand would be
816 %% $ pdflatex minimal_classic.en.tex
817 %% $ bibtex minimal_classic.en
818 %% $ latexexpand --empty-comments --expand-bbl minimal_classic.en.bbl \
819 %% > minimal_classic.en.tex > flat_thesis.tex
820 %% $ pdflatex flat_thesis
821 %% $ pdflatex flat_thesis
822 %% which produces files called flat_thesis.tex and flat_thesis.pdf that can be
823 %% returned to the library.
824 %%
825 \ltxclass[mscthesis,english,oneside]{uefcstthesis}
826 \ltxclass[mscthesis,english,oneside,tut]{uefcstthesis}
827 \classic

```

The metadata and main text are the same for classic and modern.

```

828
829 %% Replace all capital text with your own information.
830 \title{TITLE} % Title of the thesis
831 \author{GIVEN NAME}{FAMILY NAME} % Your name
832 \tut
833 \date{\thismonth} % The month and year of handing in your thesis, or \thismonth of automatic
834 \city{CITY} % Either Kuopio or Joensuu
835 \firstsupervisor{GIVEN FAMILY} % Name of the first supervisor
836 \secondsupervisor{GIVEN FAMILY} % Name of the second supervisor, if any
837 \keywords{KEYWORD1\sep KEYWORD2\sep ETC} % Keywords must be separated with \sep
838
839 %% To get the ACM CCS classification, you can visit
840 %% https://dl.acm.org/ccs/ccs.cfm
841 %% There you can find a tool to generate LaTeX code for the classification
842 %% Copy it here. You don't need to copy the XML at the begin, though.
843 %% For example,

```

```

844 %% \ccsdesc[500]{Some Class}
845 <*imlex>
846
847 %% You can change department, faculty, and university names using the
848 %% following commands (for now commented out)
849 %% \setstring{universityname}{Toyohashi University of Technology}
850 %% \setstring{facultyname}{Faculty of Robotics}
851 %% \setstring{departmentname}{Department of Computer Science}
852 %% If you need to use different languages, use \setstring[lang]{<stringname>}{<text>}.
853 %% You can use \setstring to add translations to all strings in title and abstract
854 %% pages, see uefcsthesis.pdf, section ‘‘Pre-Defined Strings and a Macro to Change
855 %% Them’’ for further information.
856 </imlex>
857 </!tut>
858 <*tut>
859 \studentid{ID} % TUT student ID number
860 \date{\today} % or \date{2023/08/15} for a fixed date
861 \firstsupervisor{FIRST SECOND} % Name of the TUT supervisor
862 </tut>
863
864 \begin{document}
865 \maketitle
866 \begin{abstract}
867   WRITE YOUR ENGLISH ABSTRACT HERE
868 \end{abstract}
869 <*!tut>
870
871 %% If you need your abstract also in Finnish, you can use
872 %% \begin{abstract}[finnish] ... \end{abstract}
873 </!tut>
874
875 \frontmatter
876 \tableofcontents
877 \mainmatter
878
879 \chapter{Introduction}
880 \label{cha:intro}
881
882 WRITE YOUR INTRODUCTION HERE
883
884 WRITE THE REST OF THE THESIS HERE
885
886 THIS IS AN EXAMPLE OF USING CITATIONS:
887 Graph generators are important \citep{metzler18random}.
888 \citet{kalofolias18from} discuss sets of redescriptions.
889
890 %% Next comes the references

```

The way the bibliography is included again depends on the engine.

```

891 <modern>\printbibliography[heading=bibintoc]
892 <*classic>
893 %% Update the following with the name of your bibliography file
894 \bibliography{minimal}
895 </classic>

```

The footer is again shared.

```
896
897 \backmatter % Do not remove!
898 %% Possible appendices come here
899 \end{document}
900 \</en>
```

Next, we'll generate the Finnish example files. The structure is the same as with the english ones.

```
901 \<fi>
902 %% Tämä on yksinkertainen esimerkki uefcsthesis-luokan käytöstä.
903 %% Tämä tiedosto tuottaa pro gradu -tutkielman yksipuoleisella asettelulla.
904 \<modern>
905 %% Tuottaaksesi PDF-tiedoston, käytä joko lualatex- tai xelatex-ohjelmaa.
906 %% Esimerkiksi:
907 %% $ lualatex minimal_modern.fi.tex
908 %% $ biber minimal_modern.fi
909 %% $ lualatex minimal_modern.fi.tex
910 %% Vaihtoehtoisesti voit käyttää latexmk-ohjelmaa:
911 %% $ latexmk -lualatex minimal_modern.fi.tex
912 %%
913 %% Palautettaessa opinnäytetyö kirjastoon mukaan täytyy liittää lähdekoodi, josta
914 %% palautettava PDF on luoto. Helpointa tämä on jos lähdekoodi on ensin tiivistetty
915 %% yhteen tiedostoon (+ erilliset kuvatiedostot). Yhdistämiseen voi käyttää latexpand-
916 %% ohjelmaa (https://www.ctan.org/pkg/latexpand), joka tulee myös TeX Live- ja
917 %% MiKTeX-jakelupakettien mukana. Esimerkkikäyttö:
918 %% $ lualatex minimal_modern.en.tex
919 %% $ biber minimal_modern.en
920 %% $ latexpand --empty-comments --biber minimal_modern.en.bbl \
921 %% > minimal_modern.en.tex > flat_thesis.tex
922 %% $ lualatex flat_thesis
923 %% $ lualatex flat_thesis
924 %% joka tuottaa tiedostot flat_thesis.tex ja flat_thesis.pdf, jotka voidaan palauttaa
925 %% kirjastoon kuvatiedostojen kanssa.
926 %%
927 \documentclass[mscsthesis,finnish,oneside,biblatex]{uefcsthesis}
928
929 %% Korvaa seuraavasta minimal.bib lähdeviitetietokantatiedostosi nimellä.
930 \addbibresource{minimal.bib}
931 \</modern>
932 \<classic>
933 %% Tuottaaksesi PDF-tiedoston, käytä pdflatex-ohjelmaa.
934 %% Esimerkiksi:
935 %% $ pdflatex minimal_classic.fi.tex
936 %% $ bibtex minimal_classic.fi
937 %% $ pdflatex minimal_classic.fi.tex
938 %% Vaihtoehtoisesti voit käyttää latexmk-ohjelmaa:
939 %% $ latexmk -pdf minimal_classic.fi.tex
940 %%
941 %% Palautettaessa opinnäytetyö kirjastoon mukaan täytyy liittää lähdekoodi, josta
942 %% palautettava PDF on luoto. Helpointa tämä on jos lähdekoodi on ensin tiivistetty
943 %% yhteen tiedostoon (+ erilliset kuvatiedostot). Yhdistämiseen voi käyttää latexpand-
944 %% ohjelmaa (https://www.ctan.org/pkg/latexpand), joka tulee myös TeX Live- ja
945 %% MiKTeX-jakelupakettien mukana. Esimerkkikäyttö:
```

```

946 %% $ pdflatex minimal_classic.en.tex
947 %% $ bibtex minimal_classic.en
948 %% $ latexexpand --empty-comments --expand-bbl minimal_classic.en.bbl \
949 %% > minimal_classic.en.tex > flat_thesis.tex
950 %% $ pdflatex flat_thesis
951 %% $ pdflatex flat_thesis
952 %% joka tuottaa tiedostot flat_thesis.tex ja flat_thesis.pdf, jotka voidaan palauttaa
953 %% kirjastoon kuvatiedostojen kanssa.
954 %%
955 \documentclass[msctheesis,finnish,oneside]{uefcstheesis}
956 \</classic>
957
958 %% Korvaa isolla kirjoitetut tekstit omilla tiedoillasi.
959 %% Työn otsikko, päiväys ja avainsanat täytyy antaa myös englanniksi
960 \title{OTSIKKO} % Työsi otsikko
961 \title[english]{TITLE} % Otsikko englanniksi
962 \author{ETUNIMI}{SUKUNIMI} % Nimesi
963 \date{\thismonth} % Työsi valmistumiskuukausi ja -vuosi tai \thismonth automaattiseen päiväy
964 %% \date[english]{MONTH YEAR} % Englanninkielistä päiväystä ei tarvita, jos käytät \thismont
965 \city{KAUPUNKI} % Joko Kuopio tai Joensuu
966 \firstsupervisor{ETUNIMI SUKUNIMI} % Ensimmäisen ohjaajan nimi
967 \secondsupervisor{ETUNIMI SUKUNIMI} % Toisen ohjaajan, jos on, nimi
968 \keywords{AVAINSANA1\sep AVAINSANA2\sep JNE} % Avainsanat erotetaan \sep-komennolla
969 \keywords[english]{KEYWORD1\sep KEYWORD2\sep ETC} % Avainsanat englanniksi
970
971 %% ACM:n CCS-luokittelun LaTeX-komennot saa luotua ACM:n työkalulla osoitteessa
972 %% https://dl.acm.org/ccs/ccs.cfm
973 %% Kopioi työkalun tuottama LaTeX-koodi tähän (alun XML-koodia ei tarvitse
974 %% kopioida). Esimerkiksi:
975 %% \ccsdesc[500]{Some Class}
976
977 \begin{document}
978 \maketitle
979 \begin{abstract}
980 KIRJOITA SUOMENKIELINEN TIIVISTELMÄSI TÄHÄN
981 \end{abstract}
982
983 \begin{abstract}[english]
984 KIRJOITA ENGLANNINKIELINEN TIIVISTELMÄSI TÄHÄN
985 \end{abstract}
986
987 \frontmatter
988 \tableofcontents
989 \mainmatter
990
991 \chapter{Johdanto}
992 \label{cha:johdanto}
993
994 KIRJOITA JOHDANTOKAPPALEESI TÄHÄN
995
996 KIRJOITA LOPUT TYÖSTÄSI TÄHÄN
997
998 TÄMÄ ON ESIMERKKI VIITTAUSTEN KÄYTÖSTÄ:
999 Verkkogeneraattorit ovat hyödyllisiä \cite{metzler18random}.

```

```

1000 \citet{kalofolias18from} etsivät jälleenkuvausten joukkoja.
1001
1002 %% Seuraavaksi tulee viiteluettelo
1003 \modern\printbibliography[heading=bibintoc]
1004 \classic
1005 %% Korvaa alta minimal oman lähdetietokantatiedostosi nimellä
1006 \bibliography{minimal}
1007 \classic
1008
1009 \backmatter % Älä poista!
1010 %% Mahdolliset liitteet tulevat tähän
1011 \end{document}
1012 \fi

```

The minimal bib-file has only two records.

```

1013 \*bib & ex
1014 @incollection{metzler18random,
1015   author = {Metzler, Saskia and Miettinen, Pauli},
1016   title = {Random Graph Generators for Hyperbolic Community Structures},
1017   booktitle = {{Proc. 7th International Conference on Complex Networks and Their Application}},
1018   editor = {Aiello, L. and Cherifi, C. and Cherifi, H. and Lambiotte, R. and Li{\`o}, P. and ...},
1019   publisher = {Springer},
1020   address = {Cham},
1021   year = {2018},
1022   pages = {680-693},
1023   doi = {10.1007/978-3-030-05411-3_54},
1024 }
1025 @article{kalofolias18from,
1026   author = {Kalofolias, Janis and Galbrun, Esther and Miettinen, Pauli},
1027   title = {From sets of good redescription to good sets of redescription},
1028   journal = {Knowl. Inf. Syst.},
1029   volume = 57,
1030   number = 1,
1031   pages = {21--54},
1032   year = 2018,
1033   doi = {10.1007/s10115-017-1149-7},
1034 }
1035 \bib & ex
1036 \ex

```

And that finishes the minimal example files.

4.11 Bibliography Records

Here are the bibliography records for the manual. We don't want to have these in the minimal examples, hence we require not to have the ex tag.

```

1037 \*bib&!ex
1038 @misc{graphicx,
1039   title = {Packages in the 'graphics' bundle},
1040   author = {Carlisle, D. P.},
1041   year = 2017,
1042   url = {https://ctan.org/pkg/latex-graphics},
1043   lastchecked = {6 December 2018},
1044 }

```

```

1045 @misc{urlbst,
1046   title = {The \textsf{urlbst} package},
1047   author = {Gray, Norman},
1048   year = 2011,
1049   url = {https://ctan.org/pkg/urlbst},
1050   lastchecked = {6 December 2018},
1051 }
1052 @misc{polyglossia,
1053   title= {Polyglossia: An Alternative to {Babel} for \hologo{XeLaTeX} and \hologo{LuaLaTeX}},
1054   author = {Charette, Fran{\c{c}}ois and Reutenauer, Arthur},
1055   year = 2018,
1056   url = {https://ctan.org/pkg/polyglossia},
1057   lastchecked = {9 December 2018},
1058 }
1059 @misc{pdfx,
1060   title = {Generation of {PDF/X}- and {PDF/A}-compliant {PDFs} with \hologo{pdfTeX} -- \text},
1061   author = {Radhakrishnan, C. V. and Thành, Hàn Th{\'}{\^e} and Moore, Ross and Selinger, Pe},
1062   year = 2017,
1063   url = {https://ctan.org/pkg/pdfx},
1064   lastchecked = {9 December 2018},
1065 }
1066 @misc{amsthm,
1067   title = {Using the \textsf{amsthm} Package},
1068   author = {{Publications Technical Group, American Mathematical Society}},
1069   year = 2017,
1070   url = {https://ctan.org/pkg/amsthm},
1071   lastchecked = {9 December 2018},
1072 }
1073 @misc{array,
1074   title = {A new implementation of \hologo{LaTeX}'s \textsf{tabular} and \textsf{array} envi},
1075   author = {Mittelbach, Frank and Carlisle, David},
1076   year = 2018,
1077   url = {https://ctan.org/pkg/array},
1078   lastchecked = {9 December 2018},
1079 }
1080 @misc{tabularx,
1081   title = {The \textsf{tabularx} package},
1082   author = {Carlisle, David},
1083   year = 2016,
1084   url = {https://ctan.org/pkg/tabularx},
1085   lastchecked = {9 December 2018},
1086 }
1087 @misc{siunitx,
1088   title = {\textsf{siunitx} --- A comprehensive (SI) units package},
1089   author = {Wright, Joseph},
1090   year= 2018,
1091   url = {https://ctan.org/pkg/siunitx},
1092   lastchecked = {9 December 2018},
1093 }
1094 @misc{bm,
1095   title = {The \textsf{bm} package},
1096   author = {Carlisle, David and Mittelbach, Frank},
1097   year = 2017,
1098   url = {https://ctan.org/pkg/bm},

```



```

1099   lastchecked = {10 December 2018},
1100 }
1101 @misc{hyperref,
1102   title = {Hypertext marks in \hologo{LaTeX}: a manual for \textsf{hyperref}},
1103   author = {Rahtz, Sebastian and Oberdiek, Heiko},
1104   year = 2017,
1105   url = {https://ctan.org/pkg/hyperref},
1106   lastchecked = {10 December 2018},
1107 }
1108 @misc{biblatex-apa,
1109   title = {{APA} {B}ib\hologo{LaTeX} style: Citation and References macros for {B}ib\hologo{LaTeX}},
1110   author = {Kime, Philip},
1111   year = 2018,
1112   url = {https://ctan.org/pkg/biblatex-apa},
1113   lastchecked = {23 December 2018},
1114 }
1115 @misc{apacite,
1116   title = {The apacite package: Citation and reference list with \hologo{LaTeX} and \hologo{BibTeX}},
1117   author = {Meijer, Erik},
1118   year = 2013,
1119   url = {https://ctan.org/pkg/apacite},
1120   lastchecked = {23 December 2018},
1121 }
1122 </bib&!ex>

```

References

- [1] D. Carlisle. The `tabularx` package, 2016. URL: <https://ctan.org/pkg/tabularx> [cited 9 December 2018].
- [2] D. Carlisle and F. Mittelbach. The `bm` package, 2017. URL: <https://ctan.org/pkg/bm> [cited 10 December 2018].
- [3] D. P. Carlisle. Packages in the ‘graphics’ bundle, 2017. URL: <https://ctan.org/pkg/latex-graphics> [cited 6 December 2018].
- [4] F. Charette and A. Reutenauer. Polyglossia: An alternative to Babel for XeLaTeX and LuaLaTeX , 2018. URL: <https://ctan.org/pkg/polyglossia> [cited 9 December 2018].
- [5] P. Kime. APA BibLaTeX style: Citation and references macros for BibLaTeX , 2018. URL: <https://ctan.org/pkg/biblatex-apa> [cited 23 December 2018].
- [6] E. Meijer. The apacite package: Citation and reference list with LaTeX and BibTeX according to the rules of the American Psychological Association, 2013. URL: <https://ctan.org/pkg/apacite> [cited 23 December 2018].
- [7] F. Mittelbach and D. Carlisle. A new implementation of LaTeX ’s `tabular` and `array` environment, 2018. URL: <https://ctan.org/pkg/array> [cited 9 December 2018].
- [8] Publications Technical Group, American Mathematical Society. Using the `amsthm` package, 2017. URL: <https://ctan.org/pkg/amsthm> [cited 9 December 2018].

- [9] C. V. Radhakrishnan, H. T. Thành, R. Moore, and P. Selinger. Generation of PDF/X- and PDF/A-compliant PDFs with pdfTeX – pdfx.sty, 2017. URL: <https://ctan.org/pkg/pdfx> [cited 9 December 2018].
- [10] S. Rahtz and H. Oberdiek. Hypertext marks in L^AT_EX: a manual for hyperref, 2017. URL: <https://ctan.org/pkg/hyperref> [cited 10 December 2018].
- [11] J. Wright. siunitx — a comprehensive (si) units package, 2018. URL: <https://ctan.org/pkg/siunitx> [cited 9 December 2018].

Change History

v0.3	General: Intial version with dtx and ins	1	v0.5.5	\ccsdesc: Updated from a newer version of acmart so that it supports classes without subclasses.	33
v0.4	General: Started using the APA citation style	1	v0.5.6	abstract : Moved the city name to a new row	34
v0.5	General: Requires at least v3.9c of babel	20		facultyname : Updated faculty name	28
	Requires colorprofiles package and recent pdfx with mathxmp option	41	v0.5.7	General: Added English title, date, keywords and abstract page to Finnish example.	45
	Sets pdfstartview to empty when generating PDF/A	41		\keywords: Update all keywords using xdef to keep the list expanded	26
v0.5.1	General: Do not use polyglossia in minimal modern examples . . .	42		\sep: Made a protected command	26
v0.5.2	\ifuefbiblatex: Replace <i>et al.</i> with <i>ym.</i> and print dates in 01.01.2021 format in Finnish bibLaTeX APA.	23	v0.5.8	General: Added thismonth as the date’s parameter	42
v0.5.3	General: Added IMLEX logos	1		\thismonth: Added.	26
	Added minimal example file for IMLEX	42	v0.6.0	General: Added minimal example files for TUT	42
	Explain how to flatten the final file	42		abstract : Added TUT layout abstract page	34
	abstract : Added different layout for IMLEX option	34		\ifuefbiblatex: Export ifuefbiblatex test.	23
	\maketitle: Added different title page layout for IMLEX option	30		\today: Redefine in TUT style using datetime2	26
	tut : Introduced the IMLEX logo option	18		\uef@studentid: Added commands to store student ID.	25
v0.5.4	acronyms : Add acronyms environment.	22		\uef@year: Added.	25
				tut : Introduced the TUT layout option	18

Index

For index terms written in typewriter font, the following convention apply: numbers written in *italic* refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in **roman** refer to the code lines where the entry is used. For all other index terms, the numbers refer to the pages of this document.

Symbols	\appendixpagename .. 239	645, 704, 707,
\' 1018, 1061	\appendixtocname 238, 241	711, 714, 717, 720
\@author 277,	\arabic ... 503, 505, 507	\captionsenglish .. 710
444, 485, 590, 740	\arraybackslash ...	\captionsenglish ..
\@author@family ...	. 587, 594, 600, 601	. 209, 212, 215,
.... 277, 559, 729	\AtBeginDocument .. 757	267, 328, 351,
\@author@first	\AtEndPreamble 722, 747	355, 359, 363,
. 277, 559, 728, 729	\Author 740	369, 375, 380,
\@concepts . 516, 569, 570	\author . 8, 277, 831, 962	383, 387, 391,
\@date 296,	\authoryear 7, 36	395, 401, 404,
301, 459, 564, 585		407, 410, 413,
\@empty 518	B	416, 617, 620,
\@ifundefined 511	\backmatter	623, 626, 629,
\@makechapterhead .. 178	. 10, 230, 897, 1009	632, 635, 638,
\@subtitle 292,	\baselineskip 608	641, 644, 703,
440, 441, 475,	\BCBL 272	706, 713, 716, 719
476, 560, 723, 724	\BCBT 271	\captionsfinnish 208,
\@tempb .. 65, 67, 82, 88	\bfseries 182	211, 214, 264,
\@tempc .. 70, 72, 83, 89	biber 7	270, 327, 350,
\@tempd .. 75, 77, 82, 88	BIB^LA^TE^X 17, <i>see</i>	354, 358, 361,
\@title 288, 439, 474,	packages, biblatex	367, 373, 379,
559, 603, 724, 726	\biblatex 36	400, 403, 406,
_ 526, 536,	\bibliography 894, 1006	409, 412, 415,
790, 818, 920, 948	\bibliographystyle . 263	616, 619, 622,
\^ 1061	\bibname 265, 268	625, 628, 631,
A	BIB^LE^TE^X 7, 17	634, 637, 640,
\abs 14, 683	\bibtex 36	643, 702, 705,
abstract (env.) .. 9, 545	\bm 14	709, 712, 715, 718
abstract page 8–11	\boolean 131	\ccsdesc 9, 516, 844, 975
\abstractname . 565, 601	\bottomrule 15	\ccsdesc@parse 521, 523
\acknowledgements .. 225	\british 5, 31	\ccsdesc@parse@end .
acknowledgements	\bscthis 5, 16	..... 521, 544
(env.) ... 10, 204	C	\ccsdesc@parse@finish
acronyms (env.) . 10, 204	\c 1054	..... 543, 544
\addbibresource 801, 930	\captionsbritish ..	\ccsname 418, 570
\addtocounter 538	. 210, 213, 216,	\centering
\algorithmcfname ..	329, 352, 356,	. 587, 594, 600, 601
.... 702, 703, 704	360, 365, 371,	\chapter 204,
\and 400	377, 381, 385,	205, 206, 879, 991
\app@m 415	389, 393, 397,	\chaptermathnum .. 7, 40
\app@o 415	402, 405, 408,	author-year 7, 17
appendices (env.) 10, 235	411, 414, 417,	harvard 17, <i>see</i> citation
\appendixname 237	618, 621, 624,	format, author-year
\appendixpagecount .	627, 630, 633,	numeric 7, 17
..... 9, 494	636, 639, 642,	citation style ... 17,

<i>see</i> citation format	<code>\documentclass</code>	<code>\familydefault</code> 155
<code>\citep</code> 887, 999	. 797, 798, 799,	<code>\fancyfoot</code> 190, 195
<code>\citet</code> 888, 1000	825, 826, 927, 955	<code>\fancyhf</code> . . 189, 194, 198
<code>\city</code> . . . 9, 321, 834, 965	<code>\draft</code> 7, 51	<code>\fancypagestyle</code> . . .
<code>\ClassError</code> 55,		. . . . 188, 193, 198
56, 57, 221, 225, 321	E	<code>\field</code> 358
<code>\ClassInfo</code> 80, 86	<code>\empty</code> 314, 569	lining 7, 17
<code>\ClassWarning</code> . 283, 285	<code>\encodingdefault</code> . . 155	old-style 7, 17
<code>\cleardoublepage</code> . .	<code>\endcor</code> 663	<code>\fill</code> 484
. . . . 201, 218, 232	<code>\endcorollary</code> 663	<code>\final</code> 7, 51
<code>\cmidrule</code> 15	<code>\endcsname</code>	<code>\finnish</code> 5, 31
<code>conjecture (env.)</code> 14, 652	. 290, 294, 298,	<code>\firstsupervisor</code> 9,
<code>\conjecturename</code> . . . 616	313, 333, 345,	286, 835, 861, 966
<code>\cor</code> 663	346, 525, 526,	<code>\floatname</code>
<code>cor (env.)</code> 663	528, 529, 530,	. 708, 709, 710, 711
<code>\corollary</code> 663	531, 532, 535, 537	<code>\frontmatter</code>
<code>corollary (env.)</code> 14, 652	<code>\endprop</code> 664	. . 9, 200, 875, 987
<code>\corollaryname</code> 616	<code>\endproposition</code> . . . 664	
<code>\counterwithout</code> . . . 681	<code>\endtitlepage</code> . 572, 613	G
<code>\csname</code> 290, 294, 298,	<code>\english</code> 5, 31	<code>\g@addto@macro</code> 530, 537
313, 333, 345,	environments:	<code>\gdef</code> 277, 278,
346, 525, 526,	abstract 9, 545	279, 280, 281,
528, 529, 530,	acknowledgements	526, 528, 529, 535
531, 532, 535, 537	. . . . . 10, 204	<code>\gradu</code> 5, 16
<code>\CurrentOption</code> . . 51, 52	acronyms . . . 10, 204	
	appendices . . 10, 235	H
D	<code>conjecture</code> . . 14, 652	harvard citations
<code>\date</code> 8, 296,	<code>cor</code> 663	17, <i>see</i> citation
833, 860, 963, 964	<code>corollary</code> . . . 14, 652	format, author-year
<code>\datebritish</code> 307	<code>definition</code> . . 14, 666	<code>\headrulewidth</code> 199
<code>\dateenglish</code> 306	<code>example</code> 14, 666	<code>\hfill</code> 585
<code>\datefinnish</code> 305	<code>lemma</code> 14, 652	<code>\hline</code> . 588, 589, 591,
<code>\DeclareDocumentCommand</code>	<code>note</code> 14, 675	595, 597, 602, 604
. 288, 292,	<code>preface</code> 10, 204	<code>\hologo</code> 1053,
296, 311, 325, 336	<code>problem</code> 14, 666	1060, 1074,
<code>\DeclareMathDelimiter</code>	<code>proof</code> 14	1102, 1109, 1116
. 686, 687	<code>prop</code> 663	<code>\hspace</code> . . . 182, 585, 593
<code>\DeclareOption</code>	<code>proposition</code> . 14, 652	<code>\Huge</code> 182
. . . . 16, 17, 22,	<code>remark</code> 14, 675	<code>\hyperref</code> 8, 44
23, 28, 29, 30, 31,	<code>tabularx</code> 15	<code>\hypersetup</code> . 13, 434,
32, 33, 34, 35, 36,	<code>theorem</code> 13, 647	465, 469, 491,
37, 38, 39, 40, 41,	<code>theorem*</code> 14	546, 573, 580,
42, 43, 44, 45, 46,	<code>\equal</code> 167	614, 751, 760, 768
47, 48, 49, 50, 51, 52	<code>example (env.)</code> . . 14, 666	
<code>\DeclarePairedDelimiter</code>	<code>\examplename</code> 616	I
. 684,	<code>\excludecomment</code> . . . 517	<code>\ifhyperref</code> 767
685, 688, 689, 690	<code>\expandafter</code>	<code>\IfNoValueTF</code> . . 326, 337
<code>\DeclareSymbolFont</code> . 155	. 290, 294, 298,	<code>\ifnum</code> 499, 539, 540, 541
<code>\DefineBibliographyStrings</code>	313, 333, 345,	<code>\ifpdfa</code> 767
. 253, 257	346, 525, 526,	<code>\ifthenelse</code> . . . 131, 167
<code>definition (env.)</code> 14, 666	528, 529, 535, 537	<code>\ifuef@bibtex</code> . . .
<code>\definitionname</code> . . . 616		. . . . . 10, 79, 244
<code>\departmentname</code> . . . 361	F	<code>\ifuef@finnish</code>
<code>\dimexpr</code> 608	<code>\facultyname</code> 361	6, 57, 163, 173, 236

[illegible]

hyperref	proof (env.) 14	\separatetheoremnumbers 8, 40
6, 8, 13, 16, 17, 41	\prop 664	\set@string 338, 340, 343
ifluatex 19	prop (env.) 663	\setcounter . . . 496, 497
ifthen 19	\proposition 664	\setdefaultlanguage 164, 168, 170
ifxetex 19	proposition (env.) 14, 652	\setlength 157, 158
inputenc 10, 19	\propositionname . . 616	\setmainfont . . . 151, 153
listings 39	\protected 310	\setotherlanguages 165, 172
listingsutf8 40	\protected@xdef 315, 318	\setstring 11, 336, 849, 850, 851, 852, 853
mathtools 38	\providecommand 708, 768	\sharedtheoremnumbers 7, 40
mdframed 35	\Publisher 743	\singlespacing 549, 583
microtype 7, 21		\space . . . 80, 86, 281, 305, 306, 307, 310, 500, 507, 512, 513, 514, 550, 560, 561, 759
natbib 23		\stepcounter 524
newtxmath 20		\StrBefore 301
newtxtext 20		\studentid . . . 8, 283, 859
pdfx 6, 8, 12, 13, 15–17, 26, 40, 41		\studyprogramname . . 379
polyglossia 5, 6, 11, 16, 17, 20, 30, 36, 39		\Subject 742
setspace 20		\subtitle 8, 292
tabularx 15, 39		\supervisorname . . . 409
textcomp 20		\supervisorsname . . 409
tocbibind 24		
xparse 24, 27		
xstring 25		
\pagegoal 608		
\pagenumbering 202, 219		
\pageref 561		
\pages 400		
\pagestyle 203, 220, 233, 769		
\pagetotal 608		
\par . . . 182, 439, 441, 444, 459, 461, 474, 476, 479, 481, 483, 487, 564, 568, 570, 584, 585, 598, 605		
\paragraph . 565, 568, 570		
\parindent 157, 180		
\parskip 158		
\PassOptionsToClass 51, 52, 93, 95		
PDF/A . . . 8, 12, 17, 40, 41		
PDF/A-1b 41		
\pdfa 8, 13, 44		
pdfL ^A T _E X 10		
\polyglossia 30		
\preface 221		
preface (env.) . . 10, 204		
\printbibliography 891, 1003		
problem (env.) . . 14, 666		
\problemname 616		
\ProcessOptions . . . 53		
	R	
	\raggedright 180	
	\rbrack 688	
	remark (env.) . . . 14, 675	
	\remarkname 616	
	\renewcommand 31, 32, 33, 38, 39, 199, 200, 217, 230, 237, 238, 239, 241, 265, 268, 271, 272, 279, 346, 433, 468	
	\renewenvironment . . 579	
	\RequirePackage 103, 115, 127, 128, 129, 134, 135, 137, 140, 142, 145, 146, 147, 149, 159, 160, 162, 175, 177, 186, 235, 246, 262, 275, 276, 300, 303, 424, 516, 575, 680, 683, 691, 696, 697, 698, 721, 749, 750, 756	
	\rightarrow 522	
	\rointerval 14, 688	
	\rOpen 686, 689, 690	
	\rule 576, 577, 578	
	\runningmathnum . . 7, 40	
	\rVert 685	
	\rvert 684	
	S	
	\secondsupervisor 9, 286, 836, 967	
	\selectlanguage 426, 430	
	\sep 9, 310, 318, 758, 759, 765, 837, 968, 969	
		T
		\tableofcontents 876, 988
		tabularx (env.) 15
		text figures 17, see figures, old-style
		\textbf 527, 539
		\textbullet 526
		\textit 540
		\textrightarrow 522, 536
		\textsc 550
		\textsf . . . 1046, 1060, 1067, 1074, 1081, 1088, 1095, 1102
		\textwidth . 461, 600, 601
		\thechapter 182
		theorem (env.) . . . 13, 647
		theorem* (env.) 14
		\theoremname 616
		\theoremstyle 646, 665, 675
		\thepage 190, 195
		\thesistype 349
		\thismonth 8, 305, 833, 963, 964

\Title	739	\uef@moderntrue ...	131	\uef@s@examplename .	
\title 8, 288, 830, 960, 961		\uef@mscthis	2	.....	637,
title page	8, 9	\uef@mscthisfalse		638, 639, 669, 673	
\titlepage	547, 581	.....	18, 24	\uef@s@facultyname .	
\today	302, 860	\uef@mscthistrue .		.....	368,
\toprule	15	.....	2, 16, 22	370, 372, 551, 735	
\tut	8, 48	\uef@numbertheoremsbychapter		\uef@s@field 358, 359,	
TUT layout 8, 9, 16, 18,		.....	8	360, 384, 386,	
19, 25, 26, 29, 31, 35		\uef@numbertheoremsbychapterfalse		457, 481, 557, 734	
\twoside	7, 28	.....	20, 26, 41	\uef@s@keywordsname	
		\uef@numbertheoremsbychaptertrue .		406, 407, 408, 568	
		.....	8, 40	\uef@s@lemmaname 619,	
U		\uef@osf	2	620, 621, 653, 658	
\uef	8, 48	\uef@osffalse	4, 35	\uef@s@notename ...	
UEF layout 8, 18, 19, 25		\uef@osftrue	34	643, 644, 645, 677	
UEF logo	8, 18	\uef@pdf@author 728, 760		\uef@s@pages ... 400,	
\uef@@@abstractstrut		\uef@pdf@subject ..		401, 402, 507, 561	
.....	574, 596	.....	733, 742, 763	\uef@s@prefacename .	
\uef@@abstractstrut		\uef@pdf@title		204, 208, 209, 210	
.....	574, 603	.....	723, 739, 761	\uef@s@problemname .	
\uef@abstractstrut .		\uef@pdfa	12	.....	634,
.....	574, 588, 590	\uef@pdfafalse ..	13, 47	635, 636, 668, 672	
\uef@all@keywords ..		\uef@pdfatru	46	\uef@s@propositionname	
.....	308, 762	\uef@polyglossia ...	5	.....	625,
\uef@appendixcounter		\uef@polyglossiafalse		626, 627, 655, 660	
.....	494	.....	5	\uef@s@remarkname ..	
\uef@appendixpages .	494	\uef@polyglossiatru ..	30	640, 641, 642, 676	
\uef@biblatex	10	\uef@printappendixpagenumbers		\uef@s@studyprogramname	
\uef@biblatexfalse .		.....	498, 562	.....	379,
.....	10, 36	\uef@printsupervisors		380, 381, 448, 555	
\uef@biblatexstyle .		.....	510, 563	\uef@s@supervisorname	
.....	10, 38, 39, 81, 87	\uef@s@acknowledgementsname		.....	409,
\uef@biblatextrue ..	37	.....	205, 211, 212, 213	410, 411, 512, 596	
\uef@city	321, 552	\uef@s@acronymsname		\uef@s@supervisorsname	
\uef@finnish	5	.....	206, 214, 215, 216	.....	412, 413, 414, 513
\uef@finnishfalse 32, 33		\uef@s@and		\uef@s@theoremname .	
\uef@finnishtrue .	6, 31	.....	403, 404, 405, 514	.....	616,
\uef@hyperref	12	\uef@s@appm		617, 618, 648, 650	
\uef@hyperreffalse .	45	.....	415, 416, 417, 505	\uef@s@thesistype ..	
\uef@hyperreftrue 12, 44		\uef@s@appo .....		.....	350, 351,
\uef@imlex	14	.....	415, 416, 417, 503	352, 354, 355,	
\uef@imlexfalse ...		\uef@s@conjecturename		356, 446, 561, 733	
.....	14, 48, 50	.....	628,	\uef@s@titlename ..	
\uef@imlextrue	49	.....	629, 630, 656, 661	.....	396, 398, 603
\uef@keywords		\uef@s@corollaryname		\uef@s@universityname	
.....	308, 568, 741	.....	622,	.....	374, 376, 378,
\uef@language .....		.....	623, 624, 654, 659	392, 394, 455,	
.....	5, 31, 32, 33,	\uef@s@definitionname		487, 550, 734, 743	
80, 86, 167, 175,		.....	631,	\uef@selectlanguage	
288, 292, 296,		.....	632, 633, 667, 671	.....	425, 436,
311, 338, 436,		\uef@s@departmentname		471, 548, 582, 748	
471, 545, 579, 748		.....	362, 364,	\uef@s@singlemathnumber	
\uef@logo .	419, 451, 461	.....	366, 388, 390,	.....	8
\uef@modern	127	.....	453, 483, 553, 588		
\uef@modernfalse ..	131				

<code>\uef@singlemathnumberfalse\uef@twosidefalse</code> ..	<code>\vspace</code> ...	179, 437,
..... 43		443, 450, 472,
<code>\uef@singlemathnumbertrue \uef@twosidetrue</code> ..		478, 480, 482,
..... 9, 42	<code>\uef@year</code>	484, 488, 567,
<code>\uef@studentid</code>	<code>\uefbiblatexfalse</code> ..	584, 586, 599, 606
..... 283, 486, 588	<code>\uefbiblatextrue</code> ..	
<code>\uef@supervisor@first</code>	<code>\underline</code>	585
..... 285,	<code>\universityname</code> ...	361
286, 512, 513, 596	<code>\unskip</code>	310
<code>\uef@supervisor@second</code>	UTF-8	3, 10, 13, 19
..... 285, 287, 514		
<code>\uef@tut</code>	14	
<code>\uef@tutfalse</code> 15, 48, 49	V	
<code>\uef@tuttrue</code>	<code>\value</code>	499, 501, 541
<code>\uef@twoside</code>	<code>\vfill</code>	445
2	<code>\vskip</code>	183
		Z
	<code>\z@</code>	180
		X
	<code>\x</code>	429, 430
	X _Y TEX	7, 10–12
	XMP 40, <i>see also</i> metadata	
		Y
	<code>\year</code>	305, 306, 307