# The cu-thesis class*

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## 1 Introduction

This is documentation for the `cu-thesis` class, a LaTeX document class that conforms the Carleton University's thesis formatting guidelines. There have been prior efforts to create a package that formats a document to Carleton's guidelines; however, these prior efforts either clash with newer LaTeX document classes, or fail to meet the thesis formatting requirements. This package attempts to extend these prior efforts by integrating them with the LaTeX `book` and KOMA-script `scrbook` document classes to provide a cleaner end-user experience. We used one prior implementation[1] as a starting point and extended off of it, porting it into a document class with an extended feature set.

## 2 Usage

Simply use `cu-thesis` as a document class. Provide arguments that you see fit, either ones that are specific to the `cu-thesis` class, or ones that are from the base class (book, scrbook) that you select. Customization of various aspects of the document (thesis title, degree, etc.) are done through configuration macros described below.

```
\documentclass[{ARGS}]{cu-thesis}
```

### 2.1 Class arguments

`scrbook` use the KOMA-script scrbook class instead of book.

`listoffigures` places a list of figures after the table of contents.

`listoftables` places a list of tables after the table of contents.

`listoflistings` places a list of listings after the table of contents. If this option is selected, you must load the listings package.

`glossary` places a list of tables after the table of contents.

`draft` enables draft features helpful for making revisions, adds a todo section to the thesis. Overlays the left margin of each page with a draft message and timestamp.

`final` disables all draft features and produces a PDF/A format output (PDF/A is

*This document corresponds to cu-thesis ?, dated ?.

[1] http://www.sce.carleton.ca/faculty/esfandiari/ThesisTemplate.zip which is based off the cam-thesis class

required for)

### 2.2 Input Macros

The following macros are used to set inputs to the various templates this class provides.

`\title` This macro sets the document title which is used in the title page and PDF metadata.

`\author` This macro sets the author's name which is used in the title page and PDF metadata.

`\thesistype` This macro sets the type of thesis as shown in the title.

`\submittedto` This optional macro sets who the thesis was submitted to, the default value is "the Faculty of Graduate and Postdoctoral Affairs".

`\degree` This macro sets the degree that the thesis counts towards as shown in the title.

`\program` This macro sets the program that the degree applies to in the title.

`\submissionnotice` This (optional) macro can be used to override the submission notice in the title page. By default, the submission notice is "A {thesistype} submitted to {submittedto} in partial fulfillment of the requirements for the degree of".

`\institution` This (optional) macro describes the institution the thesis took place, default value is "Carleton University".

`\location` This (optional) macro describes the location of the institution, default value is "Ottawa, Ontario".

`\abstract` This macro sets the abstract for the thesis, which is rendered by the `frontmatter` command.

`\acknowledgements` This macro sets the acknowledgements for the thesis, which is rendered by the `frontmatter` command.

### 2.3 Utilities and Formatting

`\frontmatter` This macro creates the frontmatter of the document, which consists of

- Title page
- Abstract
- Acknowledgements
- Table of Contents
- List of Tables (if `listoftables` option is set)
- List of Illustrations (if `listoffigures` option is set)
- List of Appendices (if `glossary` option is set)

## 3 Example Document

Here is an example document that uses this class.

```
\documentclass{cu-thesis}
\begin{document}
    Hello, world!
\end{document}
```

# 4 Implementation

⟨*package⟩

First off, declare a simple (internal) macro for creating simple boolean options. By default it will create a scoped if block that defaults to false. Also create macros for reading and setting these scoped option macros.

```
\newcommand{\cu@ifbool}[1]{\csname ifcu@#1\endcsname}
\newcommand{\cu@setbool}[2]{\csname cu@#1#2\endcsname}
\newcommand{\cu@boolopt}[1]{%
    \expandafter\newif\csname ifcu@#1\endcsname%
    \csname cu@#1false\endcsname%_
    \DeclareOption{#1}{\csname cu@#1true\endcsname}%
}
```

Next, declare all package options

```
\cu@boolopt{scrbook}
```

List of figures: puts a list of figures after the TOC.

```
\cu@boolopt{listoffigures}
```

listoftables: puts a list of tables after the TOC.

```
\cu@boolopt{listoftables}
```

listoflistings: puts a list of listings after the TOC.

```
\cu@boolopt{listoflistings}
```

glossary: puts a glossary after the TOC.

```
\cu@boolopt{glossary}
```

draft - is this a draft revision?

```
\cu@boolopt{draft}
```

final - is this a final revision?

```
\cu@boolopt{final}
```

Now process the boolean options (more options will be processed after)

```
\ProcessOptions*
```

For ease of use we will use the default LaTeX`book` class. More advanced users may prefer to use KOMA-scripts `scrbook` class, which is also supported.

The `book` and `scrbook` class arguments are not perfectly compatible, thus we have to conditionally enable some flags in certain classes.

```
\newcommand{\cu@idocclass}{book}
\cu@ifbool{scrbook}
    \renewcommand{\cu@idocclass}{scrbook}
    %% We aren't setting paper size here as it is very very tricky with koma
    %% script classes, attempts to pass to typearea seem to fail. Thus,
    %% koma script classes will have their paper size set after \LoadClass
    \PassOptionsToClass{headings=standardclasses}{\cu@idocclass}
    \PassOptionsToClass{listof=totoc}{\cu@idocclass}
\else
    \PassOptionsToClass{letterpaper}{\cu@idocclass}
\fi
\PassOptionsToClass{oneside}{\cu@idocclass}
\PassOptionsToClass{12pt}{\cu@idocclass}
\cu@ifbool{final}
    \PassOptionsToClass{final}{\cu@idocclass}
\fi
```

A noteworthy snippet: all undefined options get passed through to the underlying document class. This way, you can directly interact with all documented options for the document class we are building on.

```
\DeclareOption*{\PassOptionsToClass{\CurrentOption}{\cu@idocclass}}
```

Finally, process the remaining options and load the class.

```
\ProcessOptions\relax
\LoadClass{\cu@idocclass}
```

For koma-script classes, we can now set paper size...

```
\cu@ifbool{scrbook}
    \KOMAoptions{paper=letter,pagesize,paper=portrait}
\fi
```

At this point our document class is loaded. We can load in helpful dependencies we need.

```
\RequirePackage{iftex}
\RequirePackage{xparse}
\RequirePackage[utf8]{inputenc}
\RequirePackage[
    pdffitwindow=true,
    pdfpagelabels=true,
    colorlinks=false,
    pdfborder={0 0 0},
    pdfusetitle=true
]{hyperref}
\RequirePackage[all]{hypcap}
```

```
\cu@ifbool{glossary}
    \RequirePackage[toc,nonumberlist,acronyms]{glossaries}
    \makeglossaries%
    \setglossarystyle{listdotted}
\fi
```

Next, for creating PDF/A when in final mode we will use the helpful pdfx package.

```
\cu@ifbool{final}
    \ifluatex
        \RequirePackage{luatex85}
    \fi
    \RequirePackage[a-1b]{pdfx}
\fi
```

For page formatting, refer to the following Carleton guidelines for thesis formatting

> All written and illustrative material on an 8 1¨ x 11¨ page, including page numbers, must fall within the following margins: one and one-half inches on the left margin and one full inch on the other three sides. Margins may be wider but not narrower than the stated requirements.
>
> For theses written in landscape format, please allow one and one-half inches on the top margin and one full inch on the other three sides.

Within this context, use the `geometry` package to format the page within these bounds. A noteworthy point is that all text *including page numbers* must fall within these margins.

Doing this is tricky as geometry and koma-packages don't mix well. Use the pass option to avoid geometry directly interfering with KOMA settings

```
\RequirePackage[includefoot,includehead]{geometry}
\newcommand{\cu@setgeometry}{\geometry{%
    left=1.5in,
    right=1in,
    top=1in,
    bottom=1in}}
\cu@ifbool{scrbook}
    \AfterCalculatingTypearea{\cu@setgeometry}
    \recalctypearea
\else
    \cu@setgeometry
\fi
\reversemarginpar
```

Next is the line spacing (double), straightforward

```
\RequirePackage[doublespacing]{setspace}
```

Set up headers and footers using KOMA's scrlayer-scrpage class. This works with both the book and scrbook class. Ensure that we aren't setting draft as this will cause rulers to apperar in the header/footer.

```
\RequirePackage[automark]{scrlayer-scrpage}
\KOMAoptions{draft=false}
\clearpairofpagestyles
\chead{\headmark}
\cfoot*{\pagemark}
```

Environments used to fill sections of the thesis

We can create a macro that helps with generating these. Use xparse to create these commands, as it easily lets us define a second optional argument.

```
\NewDocumentCommand{\cu@isectioninput}{ m o }{%
    %\expandafter\newif\csname cu@ifinput#1\endcsname\csname cu@input#1false\endcsname%
    \expandafter\newcommand\csname cu@input#1\endcsname{#2}%
    \expandafter\newcommand\csname #1\endcsname[1]{%
        %% Confirm that this has been overriden
        %\expandafter\csname cu@input#1true\endcsname%
        %% Set the value
        \expandafter\renewcommand\csname cu@input#1\endcsname{##1}%
        }
}
```

abstract placed at the beginning of the thesis

```
\cu@isectioninput{abstract}
```

acknowledgements (The text that will be instered into the acknowledgments of the thesis.)

```
\cu@isectioninput{acknowledgements}
```

institution. Default to Carleton University, but can be overriden if you so wish.

```
\cu@isectioninput{institution}[Carleton University]
```

location (The location of the thesis writer's institution, which will appear just below their name.)

```
\cu@isectioninput{location}[Ottawa, Ontario]
```

keywords (These keywords will appear in the PDF meta-information called 'pdfkeywords'.)

```
\cu@isectioninput{keywords}
```

subjectline (This subject will appear in the PDF meta-information called ‘pdf-subject‘.)

```
\cu@isectioninput{subjectline}
```

submissiondate (The date of the submission of this thesis.)

```
\cu@isectioninput{submissiondate}
```

type (The type of document, e.g., thesis, thesis proposal, dissertation.)

```
\cu@isectioninput{thesistype}
```

submitted to

```
\cu@isectioninput{submittedto}[the Faculty of Graduate and Postdoctoral Affairs]
```

submissionnotice (The submission notice is shown on the bottom of the title page.) Faculty of Graduate and Postdoctoral Affairs

```
\cu@isectioninput{submissionnotice}[%
    A {\cu@inputthesistype} submitted to {\cu@inputsubmittedto}\\%
    in partial fulfillment of the requirements for the degree of]
```

degree (The degree for which this thesis is written.)

```
\cu@isectioninput{degree}
```

program (The program for which this thesis is written.)

```
\cu@isectioninput{program}
```

Chapter and section numbering

```
\setcounter{secnumdepth}{3}
\setcounter{tocdepth}{3}
```

Command to create the title page that follows Carleton's template

```
\newcommand{\cu@maketitle}{
    \newgeometry{margin=1in}
    \begin{titlepage}
        \begin{center}
            {
                \Large\bfseries
                \@title
            }
            \bigbreak
            {
                by
            }
            \bigbreak
            {
                \Large\bfseries
                \@author
            }
            \vfill
            {
                \cu@inputsubmissionnotice
            }
            \vfill
            {
                \large\bfseries
                \cu@inputdegree
            }
            \bigbreak
```

```
            {
                in
            }
            \bigbreak
            {
                \large\bfseries
                \cu@inputprogram
            }
            \vfill
            {
                \cu@inputinstitution\\
                \cu@inputlocation
            }
            \vfill
            {
                \textcopyright~\cu@inputsubmissiondate,~\@author
            }
        \end{center}
    \end{titlepage}
    \restoregeometry
}
```

Implementation of command to create the frontmatter Frontmatter follows the following format

- Title page
- Abstract
- Acknowledgements
- Table of Contents
- List of Tables
- List of Figures
- List of Listings (optional if the listings package is loaded)
- List of Appendices Start off by creating the frontmatter command, create the title page

```
\renewcommand{\frontmatter}{
    \cu@maketitle
```

Set up the page formatting for the rest of the paper A note on page numbering, from the requirements: “Small Roman numerals are used in the preliminary section. All pages are to be numbered except for the title page on which number “i” is implied but not given...”

```
    \pagenumbering{roman}
    \setcounter{page}{1}
    \hypersetup{pdftitle={\@title},pdfauthor={\@author},pdfkeywords={\cu@inputkeywords}}

```

Create abstract page

```
    \chapter*{Abstract}
    \addcontentsline{toc}{chapter}{Abstract}
```

```
    \cu@inputabstract
    % Acknowledgements
```

Create acknowledgements page

```
    \chapter*{Acknowledgements}
    \addcontentsline{toc}{chapter}{Acknowledgements}
    \cu@inputacknowledgements
```

Create TOC

```
    % TOC
    \tableofcontents
```

Create list of tables if option is set

```
    \cu@ifbool{listoftables}
        \listoftables
    \fi
```

Create list of figures if option is set

```
    \cu@ifbool{listoffigures}
        \listoffigures
    \fi
```

Create list of listings if option is set. A potential todo is to ensure that we correctly handle some quirks on scrbook vs plain book. For more information refer to the scrbook manual.

We also ensure that the title of the list of listings is "List of Listings" and not "Listings". This is to be consistent with the other "List of" sections.

```
    \cu@ifbool{listoflistings}
        \@ifpackageloaded{listings}{%
            \renewcommand\lstlistingname{Listing}%
            \renewcommand\lstlistlistingname{List of Listings}%
            \lstlistoflistings%
        }{\PackageError{cu-thesis}{listings package not loaded}{%
        The listoflistings option is set but the listings package is not loaded.%
        Load the package before calling \\frontmatter}%
        }
    \fi
```

Create glossaries if option is set

```
    \cu@ifbool{glossary}
        \printglossaries
    \fi
    \newpage
```

End of frontmatter, use arabic numbers for rest of thesis. Ready to start chapter 1.

```
    \setcounter{page}{1}
    \pagenumbering{arabic}
}
```

If 'draft' is set, we want to clearly label this copy of the thesis as a draft. We include a timestamp in case a reviewer sees multiple revisions of the thesis and needs to differentiate between versions.

```
\cu@ifbool{draft}
    \RequirePackage{datetime2}
    \DTMsettimestyle{hmmss}
    \usepackage[all]{background}
```

```
    \SetBgContents{\color{gray!50!white} [DRAFT: Rev. as of \DTMnow]}
    \SetBgPosition{current page.west}
    \SetBgVshift{-1.0cm}
    \SetBgOpacity{1.0}
    \SetBgAngle{90.0}
    \SetBgScale{2.0}
\fi
```

⟨/package⟩