The *new* MIT thesis template

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The MIT thesis template

LaTeX has changed tremendously since the original MIT thesis template was written in the 1980s. LaTeX 2.09 was replaced by LaTeX2e in the 1994. Many packages and fonts were developed to accompany the original platform, particularly after 2000; and major updates to the LaTeX kernel began in 2018. Further, the MIT Libraries changed the required format several times, especially as electronic thesis submission became the norm. The original template served MIT well, but by the early 2020's, it was substantially out of date.

This *new* MIT thesis template was developed in 2023 at the request of the MIT Libraries. The title and abstract pages strictly follow the current requirements of the Libraries. The underlying code is entirely new.

System requirements

The new `mitthesis` class uses the features of LaTeX as of 2022, with limited backward compatibility. An up-to-date LaTeX system is therefore necessary when using this template.

LaTeX is a free, open source system. The entire system is distributed through the TeX Live platform (https://www.tug.org/texlive/), including the basic format, packages, and user interfaces. The system operates on Windows, MacOS, and Unix/Linux. TeX Live is formally updated each year in the spring, and the associated utility package allows users download the most current codes more frequently if they desire. (At the time of this writing, the commercial platform Overleaf.com provides similar functionality.)

If you are missing a package or documentation, you may obtain it at no cost from CTAN (ctan.org).

LaTeX engine

The template works with either pdfTeX or unicode engines such as LuaLaTeX. With the latter, fonts that you install in your operating system can be configured for use in your thesis. LuaLaTeX also enables the direct use of lua code in your `.tex` file.

Downloading the template

The files needed for preparing your thesis are in the CTAN repository: https://ctan.org/pkg/mitthesis. Copy the subdirectory `MIT-thesis-template` onto your system. That directory contains files you can modify into your own thesis.

If `mitthesis.cls` is installed in your system (e.g., if you use an up-to-date version of TeX Live), you are all set. If not, copy the file `mitthesis.cls` into your working directory. If you plan to use fonts other than the default fonts, you may also copy the subdirectory `fontsets` as a subdirectory of your working directory.

File structure

The new MIT thesis template consists of: `mitthesis.cls`; a root file `MIT-Thesis.tex`; a file to load the abstract, `abstract.tex`; a file for design options, `mydesign.tex`; and an optional file to change the fonts (see the subdirectory, `fontset`). You should change the name of the root file to something more descriptive of your own work (e.g., `JohnsThesis.tex`, `MagnumOpusScientiae.tex`,...). In addition, files must be loaded for acknowledgments, an optional biosketch, chapters, optional appendices, and bibliography.

Information you need to complete

Various fields and commands must be changed to your own information in the preamble of `MIT-Thesis.tex` and immediately after the `\begin{document}` command. This information includes the title, author, degree and other essential information. With the comments in `MIT-Thesis.tex`, this step should be self-explanatory. Nevertheless some comments follow.

In the `\hypersetup{..}` command, change the sample file to match your own information (name, title, keywords, etc.). These commands generate metadata that are incorporated into the pdf file.

If your title page overflows (from too many authors, degrees, etc.), you can scale down the signature block at the bottom by issuing this command: `\SignatureBlockSize{\small}`.

The remaining commands are listed below.

- `\title{the title of your thesis}`

- `\Author{author full name}{author department}[1st PREVIOUS degree][2nd...`
  Note that third, fourth, fifth, and sixth arguments are optional [..] and may be omitted. Use once for each author.

- `\Degree{name of degree}{department giving degree}`. Use once for each degree fulfilled by thesis

- `\Supervisor{supervisor name}{supervisor department}`. Use once for each supervisor.

- `\Acceptor{acceptor name}{acceptor title}{thesis related position}`. Professor who accepts theses for your department (e.g., the Graduate Officer). Use once for each department.

- `\DegreeDate{Month}{year}`. Date degree is awarded (February, June, or September).

- `\ThesisDate{date}`. Date that your final thesis is submitted to the department.

Copyright license

If you wish to make your thesis available under a Creative Commons License, issue the following command between `\begin{document}` and `\maketitle`: `\CClicense{license type}{license url}`. For example,

  `\CClicense{CC BY-NC-ND 4.0}{https://creativecommons.org/licenses/by-nc-nd/4.0/}`.

Package options

Package options may be specified for `\documentclass{mitthesis}[..]`. These options are described in Table 1 and the subsections that follow.

Table 1: Options to the document class

Package option	Effect
fontset	is a keyvalue, fontset = <name>, which selects the set of fonts used for the thesis. See description below.
lineno	this option loads the lineno package, which provides line numbers, as for editing. The lineno package provides additional commands to control line numbering.
mydesign	this option loads the file mydesign.tex, which in turn loads the packages xcolor, titlesec, enumitem, caption, subcaption, and anything else that affects document design. You may edit mydesign.tex as you prefer.
twoside	gives facing-page behavior for two-sided printing; omitting it will eliminate the even-numbered blank pages.

Font loading

By default, mitthesis.cls will load the traditional LaTeX fonts, computer modern (pdfTeX) or latin modern (unicode engines). By using the key value fontset=⋯ in the \documentclass command, you can select a different set of fonts.

Ten fontsets are predefined, including the default set (see Table 2). Three work only with pdfTeX, four work only with unicode engines, and three work with either. These options include a mixture of serif or sans serif text and math fonts, as shown in the table.

Among these fonts, Termes and NewTX are serifed fonts similar to the digital font Times New Roman. STIX Two is more similar to the original metal-type Times font. Linux Libertine is a serif font inspired by 19th century book type. Lucida is a serifed font designed for high legibility at small size or on low resolution devices. This font is excellent for mathematics and includes a complete bold-face math font, but it is not free. Heros and NewTX-sans are sans-serif text fonts similar to Helvetica. NewTXsf is a sans-serif math font which draws upon glyphs from the STIX font. Fira is a humanist sans-serif text font designed in association with the Firefox browser. Finally, Computer Modern (and its extension Latin Modern)—the traditional "LaTeX font"—is a Didone font, with high contrast between thick and thin elements.

You may also write your own fontset file, say Myfontset.tex, and then load it with

$$\texttt{\textbackslash documentclass[fontset=Myfontset]\{mitthesis\}}$$

Design options

The thesis will follow the default styles of the LaTeX report class for sections headings, captions, and lists. If you prefer different styles you can use the class option [mydesign] which loads the file mydesign.tex.

With mydesign.tex, you can set options for packages that manage color, e.g. xcolor, that change the margins, or that change the design of titles, captions, and lists: titlesec, caption, or enumitem. You can also load other packages. The mitthesis class will insert these commands at the appropriate point (prior to loading babel, fonts, or hyperref). You should not need to edit the class file.[1]

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[1]If you are using different style files, say styleA.tex and styleB.tex, you can switch between them with the options [mydesign=styleA] and [mydesign=styleB].

Table 2: Predefined font sets

fontset	pdfTeX	unicode	text font	math font	details
fira-newtxsf	yes	no	sans	sans	included in TeX Live
newtx	yes	no	serif	serif	included in TeX Live
newtx-sans-text	yes	no	sans	serif	included in TeX Live
default	yes	yes	serif	serif	CM & LM fonts are included in TeX Live
libertine	yes	yes	serif	serif	in TeX Live for pdfTeX. For unicode, OpenType text fonts freely available here https://sourceforge.net/projects/linuxlibertine/ and the math font here https://github.com/alerque/libertinus
lucida	yes	yes	serif	serif	the lucida fonts are available from the TeX User's Group, https://tug.org/store/lucida
heros-stix2	no	yes	sans	serif	http://www.gust.org.pl/projects/e-foundry/tex-gyre https://github.com/stipub/stixfonts both fonts are free
stix2	no	yes	serif	serif	https://github.com/stipub/stixfonts, fonts are free
termes	no	yes	serif	serif	http://www.gust.org.pl/projects/e-foundry/tex-gyre fonts are free
termes-stix2	no	yes	serif	serif	http://www.gust.org.pl/projects/e-foundry/tex-gyre https://github.com/stipub/stixfonts both fonts are free
Typewriter (monospaced) fonts are also loaded for unicode					Inconsolata (sans serif): https://ctan.org/tex-archive/fonts/inconsolata Cursor (serif): http://www.gust.org.pl/projects/e-foundry/tex-gyre

Single-sided vs. double-sided layout

The sample template uses the option [twosided], which starts major sections (abstract, table of contents, chapters, etc.) on odd-numbered pages. This arrangement is suitable for two-sided printing, but can lead to empty even-numbered pages. If you do not wish to have this behavior, omit that option. By default, even and odd page margins are the same; this can be changed in the mydesign.tex file if necessary.

PDF/A compatibility

PDF/A-2b compliance will be automatic if the \DocumentMetadata{..} command is issued before the \documentclass{..} command and *provided that your graphics are also compliant*. This command was added to LaTeX in June 2022. For older versions of LaTeX, the mitthesis class will fall back to loading hyperxmp to support pdf metadata, but PDF/A compliance will require post-processing (for example, by using the PreFlight function of Adobe Acrobat). An up-to-date LaTeX installation is preferred.

Current LaTeX development (ca. 2023) is working toward fully accessible PDF/A out of the box (e.g., PDF/A-2a). Unicode compliance (e.g., PDF/A-2u) depends greatly on your fonts and figures.

Packages for math, chemistry, code listings, and more

The `mitthesis` class loads the `amsmath` package and its extension `mathttools`. These packages provide many useful macros for typesetting equations and symbols, such as: environments for aligning and splitting equations or groups of equations; tools for matrices; a wide variety of operators and symbols; tools to define new math operators and paired delimiters; and much, much more. If you are including equations, look at the documentation for these packages: https://ctan.org/pkg/amsmath and https://ctan.org/pkg/mathtools.

Specialized packages for many disciplines can be found in CTAN. These include subjects like chemistry, linguistics, and physics. As examples of such packages, the sample thesis template uses the package `mhchem` to set chemical equations and the package `listings` to list computer code.

When selecting a package to use, check that it is currently maintained (with relatively recent updates), and compare it to other packages that perform similar functions. Some packages are better than others, and some obsolete packages remain online.

Nomenclature

An optional nomenclature environment is provided by the class. This environment can support either chapter-by-chapter nomenclature (at the section level) or a single nomenclature for the entire thesis (at the chapter level). The environment has three optional arguments: [1] adjust space between symbol and definition; [2] name (heading) of the nomenclature list; and [3] level, which can be "section" or "chapter" depending on whether you have one nomenclature list for whole thesis or one for each chapter.

For example, the following code

```
\begin{nomenclature}[2em][Nomenclature for Chapter 1][section]
\EntryHeading{Roman letters}
\entry{$A$}{the letter A}
\EntryHeading{Greek letters}
\entry{$\Gamma$}{circulation}
\end{nomenclature}
```

produces the nomenclature list below

Nomenclature for Chapter 1

Roman letters
A the letter A

Greek letters
Γ circulation

Resources for LaTeX

LaTeX documentation is easy to find online. A few useful resources, among many, are these:

LaTeX Wikibook. https://en.wikibooks.org/wiki/LaTeX. An online tutorial book.

LaTeX2e: An unofficial reference manual. https://latexref.xyz/dev/latex2e.html. A comprehensive explanation of each LaTeX command, from the TeX User's Group.

TeX Stack-Exchange. https://tex.stackexchange.com/. More than 250,000 answered questions, and you can ask your own!

Table 3: External packages used. For documentation, visit CTAN, https://ctan.org. Alternatively, if you have TeX Live installed, you can open a terminal window and type % `texdoc package-name`.

Package	Class	User
bookmarks	is loaded automatically under the new pdf-management system	—
doi	support for hyperlinking DOIs	hyperlink a doi number: `\doi{..}`
etoolbox	extend or modify other macros	can use in preamble if needed
iftex	check which LaTeX engine is running	macros to check engine
ifthen	streamlined conditionals	can use in preamble if needed
geometry	set page size and margins	—
graphicsx	support for inserting images	use to include graphics
hyperref	support for hyperlinks and metadata	must complete setup in preamble
hyperxmp	fallback if no `\DocumentMetadata{..}`	—
kvoptions	key values for systems pre 2022/11/01	—
mathtools	loads and extends amsmath	**many useful math macros available**. See documentation for `amsmath` and `mathtools`
xparse	for systems older than 2020/10/01	macros to define new commands
lineno	option for the class	keyvalue `lineno` will give line numbers; `lineno` package has additional commands that control line numbering
caption	also loaded by `mydesign.tex`	support for caption styling
subcaption	also loaded by `mydesign.tex`	support for subfigures within figures
titlesec	also loaded by `mydesign.tex`	support for styling section headings
xcolor	also loaded by `mydesign.tex`	support for colors, including colored fonts
babel	—	if you use multiple languages, load `babel` in a fontset file before loading fonts
biblatex	—	sample template uses this bibliography tool. Change to `natbib` if you prefer
fontenc	—	load this in a fontset file if using pdfTeX
fontspec	—	load this in a fontset file if using a unicode engine (`unicode-math` loads `fontspec` by default)
lipsum	—	create filler text (see sample template, Chapter 1)
listings	—	for listing computer code (see sample template, Appendix A)
mhchem	—	to format chemical formulæ (see sample template, Chapter 1)
setspace	—	used to change the default line spacing, if desired (e.g., for "double-spacing")
unicode-math	—	load in a fontset file if using a unicode engine