The MIT thesis template

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1 May 2025

SUMMARY

This LaTeX class formats theses according to the requirements of the MIT Libraries. The template is suitable for MIT theses of all types and at all levels. The title and abstract pages are automatically laid out from information provided by the user. The template includes options to use a variety of typefaces, and it is compatible with either pdfTeX or unicode engines such as LuaLaTeX. When using LaTeX formats dated November 2022 or later, the resulting pdf file meets the PDF/A-2b archivability standard. A standard TeX Live installation includes all other packages required by the template. This document provides instructions for installation and use of the template.

Contents

1 BACKGROUND

The original MIT Thesis template was written LaTeX 2.09 by Stephen Gildea in the late 1980s (in CTAN, here). That template was edited by many later students.

LaTeX has changed greatly since the original MIT thesis template was written. LaTeX 2.09 was replaced by LaTeX 2$_\varepsilon$ in 1994. New engines were developed, particularly pdfTeX during the 1990s and Unicode-aware engines in the decades that followed. Many packages and fonts were developed to accompany the original platform, particularly after 2000; and major updates to the LaTeX kernel began in 2018. Over the years, 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 The original template served MIT well; but by the early 2020s, it was substantially out of date. That situation motivated the creation of a new template.

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, with extensive use of `expl3` syntax.

2 SYSTEM REQUIREMENTS AND INSTALLATION

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 to download the most current codes more frequently if they desire. (At the time of this writing, the commercial platform Overleaf.com provides a similar functionality.)

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

2.1 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 the most current version of `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, ensure that the subdirectory `fontsets` is present in your working directory.

2.2 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.

2.3 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. With Lua code, you can automate plotting, table generation, and other numerical computations. LuaLaTeX will become the primary LaTeX engine over time.

2.4 PDF/A compliance

PDF/A-2b compliance is automatic if `\DocumentMetadata{pdfstandard = a-2b, pdfversion=1.7}` 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, PDF/A compliance requires post-processing (for example, by using the PreFlight function of Adobe Acrobat).

Current LaTeX development (ca. 2025) is working toward fully *accessible* PDF/A. LaTeX already supports the PDF 2.0 standard, and PDF tagging is under development. Depending upon the packages loaded, the template run under the LuaLaTeX engine can produce "well-tagged pdf": PDF/UA-2 or PDF/A-4F. Note that compliance can depend on your fonts and figures (e.g., for PDF/UA-2).

3 SETTING UP TITLE PAGE, ABSTRACT, AND BIBLIOGRAPHY

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 explanation follows.

1. In the `\hypersetup{..}` command, change the sample file to match your own information (e.g., keywords, subject, etc.). These commands generate metadata that are incorporated into the pdf file.
2. `\title{the title of your thesis}`
3. `\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.
4. `\Degree{name of degree}{department giving degree}`. Use once for each degree fulfilled by the thesis.

   If two departments jointly issue a single degree, leave the degree name blank for the *second* degree: `\Degree{}{2nd department name}`. If the thesis satisfies two degrees from one department, leave the department argument blank for the *second* degree: `\Degree{2nd degree name}{}`.

   If you wish to cause a line break in a very long degree name, you can insert `\\` at an appropriate point. Department names should not break across lines. For example:

   ```
   \Degree{Doctor of Philosophy \\ in \\ Electrical Engineering and Computer
      Science}{Department of Electrical Engineering and Computer Science}
   ```

5. `\Supervisor{supervisor name}{supervisor title}`. Use once for each supervisor. See §6.2 if your supervisor has more than one title.
6. `\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.

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

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

3.1 Copyright license

By default, the thesis template reserves all rights to the author, with a carve-out for MIT. If you wish to make your thesis available under a Creative Commons License, issue the following command between `\begin{document}` and `\maketitle`: `\CCclicense{license type}{license url}`. For example,

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

MIT thesis copyright options and policies and Creative Commons licenses are discussed on these links:
https://libraries.mit.edu/distinctive-collections/thesis-specs/#owner
https://creativecommons.org/share-your-work/cclicenses/

3.2 Bibliography

You may generate your bibliography using either `biblatex/biber` or `natbib/bibtex`. The template is set up for `biblatex` by default, rather than the older, less flexible `natbib`. The `biblatex` package is very powerful, and you can customize most aspects the reference list and citations to suit your needs. See the documentation for details: ctan.org/pkg/biblatex.

The style of citations and references can be set in your `.tex` file. For numerical citations of references (e.g., [1]), you can do

```
\usepackage[style=ext-numeric-comp,giveninits=true,sorting=none,
    language=american]{biblatex}
```

For IEEE style citations and references, you might do

```
\usepackage[style=ieee,maxbibnames=10,sorting=none]{biblatex}
```

For author/year style (Smith, 2024), you might do

```
\usepackage[style=authoryear, maxbibnames=10]{biblatex}
```

In the author/year style, `\cite{..}` commands do not automatically produce parentheses. Instead, you can do `\parencite{..}` to get "(Author, year)."

4 CLASS OPTIONS

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

4.1 Font loading

By default, `mitthesis.cls` will load the traditional LaTeX typeface, Computer Modern (for pdfTeX) or Latin Modern (for unicode engines). By using the key value `fontset=⋯` in the `\documentclass` command, you can select a different set of fonts.

Eleven font sets are predefined, including the default set (see Table 2). Three work only with pdfTeX, four work only with unicode engines, and four work with either. These options include a mixture of serif or sans serif text and math fonts, as shown in the table. To access the predefined font sets, you *must* have the directory `fontsets` as a subdirectory of your working directory, including its files as named. The relevant

fonts must also be on your computer; but all (except Lucida) are included in TeX Live and will be present in a complete LaTeX installation.

Among the predefined font sets, Termes and NewTX are serifed typefaces similar to the digital typeface Times New Roman. STIX Two is more similar to the original metal-type Times typeface. Libertinus (a fork of Linux Libertine) is a serif typeface inspired by 19th century book type. Lucida is a serifed typeface designed for high legibility at small size or on low resolution devices. Lucida 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 typefaces similar to Helvetica. NewTXsf is a sans-serif math font which draws upon glyphs from the STIX fonts. Fira is a humanist sans-serif text typeface designed in conjunction with the Firefox operating system. Finally, Computer Modern (and its extension Latin Modern)—the traditional LaTeX typeface—is a Didone typeface, with high contrast between thick and thin elements. The `lmodern` fontset replaces Computer Modern by Latin Modern when running pdfTeX.

You may also place your own font-set file, say `Myfontset.tex`, in your working directory, and load it with: `\documentclass[fontset=Myfontset]{mitthesis}`.

4.2 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`, or that change the design of titles, captions, and lists: `titlesec`, `caption`, or `enumitem`. You can change the margins with `\newgeometry{..}` from the `geometry` package. You can also load other packages. You can also insert any other code to change the design, for instance, you can renew the definition of `\section` to change fonts, font color, or font features (using commands from the `fontspec` package with LuaLaTeX).

The `mitthesis` class will insert the content of `mydesign.tex` at the appropriate point (prior to loading `babel`, fonts, or `hyperref`). You should not need to edit the class file.

The class option `[mydesign]` can also be used as a key value, in the form `[mydesign=some-file]`, where `some-file.tex` will be loaded if it is in your working directory. Two examples of design files are in the `examples` directory. One, `mydesign_redsans_headings`, puts chapter headings, section headings, and caption labels in dark red, sans-serif type. This option pairs well with fontsets like `newtx` and `termes-stix2`. The second, `mydesign_libertinus_headings`, uses stylistic alternate characters and ligatures in chapter titles and section headings, and it puts caption labels in bold type. This style only runs with the `libertinus` fontset; by editing this file, you can limit the use of alternates to chapter titles to provide a more restrained design. These are simply examples, not official MIT styles.

Table 1: Options to the document class

Class 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 code or packages that change the style of titles, headings, captions, margins, lists, and so on. You may edit `mydesign.tex` as you prefer or use the option as a key value to load a different file, `[mydesign=some-file]`
`twoside`	gives facing-page behavior for two-sided printing; omitting it will eliminate the even-numbered blank pages.

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
libertinus	yes	yes	serif	serif	included in TEX Live
lmodern	yes	yes	serif	serif	included in TEX Live
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	included in TEX Live
stix2	no	yes	serif	serif	included in TEX Live
termes	no	yes	serif	serif	included in TEX Live
termes-stix2	no	yes	serif	serif	included in TEX Live
Typewriter (monospaced) fonts are also loaded for unicode					Inconsolata (sans serif): included in TEX Live Cursor (serif): included in TEX Live

Hyperlink colors and pdf bookmark or viewing options from the `hyperref` package can be changed by using `\hypersetup{ .. }` in the preamble or using `\AtBeginDocument{ \hypersetup{ .. } }` in the `mydesign.tex` file.

4.3 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 `mydesign.tex` if necessary.

4.4 Additional commands

The class also provides `\DegreeYear`, `\DegreeMonth`, and `\CopyrightAuthor`. The latter combines all author names into a single token list, e.g., "Joseph O. Hirschfelder, Charles F. Curtiss and R. Byron Bird"; a period at the end of the final name (e.g., as in "John F. Nash Jr.") is removed.

4.5 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 four optional arguments: [1] adjust space between symbol and definition (default is 2 em); [2] title of the nomenclature list (default is "Nomenclature"); [3] level, which can be "chapter" or "section" depending on whether you have one nomenclature list for whole thesis or one for each chapter (the default is section); and [4] the style of the entry in the table of contents, which can be given as "frontmatter" or "backmatter" if you are using a single nomenclature for the whole thesis (default is to match [3]).

A single-column nomenclature list is produced by `\begin{nomenclature}`. A two-column nomenclature list is produced by `\begin{nomenclature*}`, provided that `\usepackage{multicol}` is added to your preamble.

For example, with \usepackage{multicol} in the preamble, the following code

```
\begin{nomenclature*}[2em][Nomenclature for Chapter 1][section]
\EntryHeading{Roman letters}
\entry{$\mathcal{C}$}{material curve}
\entry{$\mathbf{r}$}{material position [m]}
\entry{$\mathbf{u}$}{velocity [m $\cramped{\textrm{s}^{-1}}$]}
\EntryHeading{Greek letters}
\entry{$\Gamma$}{circulation [$\cramped{\textrm{m}^2}$ $\cramped{\textrm{s}^{-
1}}$]}
\entry{$\rho$}{mass density [kg $\cramped{\textrm{m}^{-3}}$]}
\entry{$\symbfup{\omega}$}{vorticity [$\cramped{\textrm{s}^{-1}}$]}
\end{nomenclature*}
```

produces the two-column nomenclature list below:[1]

Nomenclature for Chapter 1

Roman letters

$\mathscr{C}$	material curve
$\mathbf{r}$	material position [m]
$\mathbf{u}$	velocity [m $^{s-1}$]

Greek letters

Γ	circulation [m^2 s^{-1}]
ρ	mass density [kg mm^{-3}]
$\boldsymbol{\omega}$	vorticity [s^{-1}]

5 PACKAGES FOR MATH, CHEMISTRY, CODE, TABLES, 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.

Several packages focus on table and tabular environments. The booktabs package, used in the sample thesis template, produces better quality horizontal lines (called *rules*) for separating material in tables. The array package (also used) provides additional options for column formats in tabular environments, the dcolumn package (also used) aligns columns of numbers on the decimal separator, and the longtable package (also used) formats multipage tables with automatic page breaking.

When selecting a package, 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.

The packages called by mitthesis are listed in Table 3 on page 8.

[1] The command \cramped is from the mathtools package; it sets the superscript slightly lower. The command \symbfup is from the unicode-math package, which is automatically loaded when running LuaLaTeX; in pdfTeX, use \bm{\omega} instead.

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	Purpose in class file	How it can be used
bm	defines commands to access bold math symbols (loaded for default fonts)	with pdfTEX, the command \bm{..} produces a bold math symbol
bookmark	is loaded automatically by \DocumentMetadata	customize pdf bookmarks
doi	support for hyperlinking DOIs	hyperlink a doi number: \doi{..}
etoolbox	extend or modify other macros	can use in preamble to modify macros, if needed
geometry	set page size and margins	can use \newgeometry in mydesign.tex
graphicsx	support for inserting images	use to include graphics
hyperref	support for hyperlinks and metadata	must complete metadata setup in preamble
mathtools	loads and extends amsmath	**many useful math macros available**. See documentation for amsmath and mathtools
hyperxmp	fallback if no \DocumentMetadata{..}	—
kvoptions	key values for systems pre 2022/11/01	—
xparse	for systems older than 2020/10/01	macros to define new commands
lineno	loaded if this class option is given	keyvalue lineno will give line numbers; lineno package adds commands to control numbering
caption	could also be loaded in mydesign.tex	support for caption styling
subcaption	could also be loaded in mydesign.tex	support for subfigures within figures
xcolor	could also be loaded in mydesign.tex	support for colors, including colored fonts
array	—	additional options for formatting table columns
booktabs	—	better quality tables, with additional commands
dcolumn	—	align number columns on selectable separators
longtable	—	multipage tables with automatic page breaking
microtype	—	typographical refinements: character protrusion, font expansion, letter spacing (tracking), etc.
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)
multicol	—	used in two-column nomenclature list
setspace	—	can be loaded 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

6 TROUBLESHOOTING AND MODIFICATIONS

6.1 Listing thesis committee members or using a signature page

Listing committee members (with or without signatures) is not required under MIT's thesis specifications. Only the thesis supervisor should appear on the title page, not a list of committee members. However, some departments may require a separate committee or signature page. That page can be inserted by the author between the title and abstract pages. Check with your department about this page and any associated formatting requirements.

6.2 Dealing with multiple titles in the signature block

When a thesis supervisor has multiple titles (which will not fit on one line), you can obtain a line break with proper horizontal spacing by doing

```
\Supervisor{name}{first title and \\ & second title}
```

The same trick works in the `\Acceptor` command. **TEXhackers note:** The signature block is typeset as a LaTeX `tabular` environment as of version 1.18 (in earlier versions, a tabbing environment was used).

6.3 Overflowing title page: managing space

If your title page overflows the vertical space (from too many authors, degrees, previous degrees, etc.), you can use some or all of the following techniques. The commands must be given before `\maketitle`.

1. Reduce the 12 pt and 18 pt skips between the various blocks of text to 6 pt with this command:

   ```
   \Tighten
   ```

2. Reduce the font size in the signature block with this command:

   ```
   \SignatureBlockSize{\small}
   ```

3. Put the acceptor name and title onto two lines, rather than three, by putting the acceptor's position into the 2nd argument and leaving the 3rd argument blank:

   ```
   \Acceptor{Tertius Castor}{Professor and Graduate Officer, Department of Research}{}
   ```

4. Reduce the font size of the the author name[s] from `\large` to `\normalsize` with this command:

   ```
   \AuthorNameSize{\normalsize}
   ```

5. Omit previous degrees from the title page, instead mentioning them in the biographical sketch.

6.4 Push title page text toward top

If you prefer to keep the text toward the top of the page with most white space at the bottom, you can use this command to squash the vertical glue (TEX's stretchy space):

```
\Squash
```

This command is useful when the text has not already reach the bottom of the page, since the glue gets squashed automatically when the page is too full.

6.5 Changing paragraph separation

If you prefer to denote paragraph breaks by vertical space rather than indentation, you can try the `parskip` package: ctan.org/pkg/parskip. See that package's documentation for details.

6.6 Use outside MIT

To adapt this template for use at a different institution, you can put the following commands in your preamble.

- Use `\Institution{Your Institution}` to change MIT to your own institution on the title page.
- Use `\maketitle*` (in place of `\maketitle`) to drop the MIT copyright permission statement
- If your institution issues degrees in months other than February, May, June, or September, you can still put those months into the `\DegreeDate` command. To suppress the resulting error message, put `\SuppressMonthError` before `\maketitle*`.
- Omitting `\Acceptor` commands will drop the "Accepted by:" field. To suppress the resultant error message, put `\SuppressAcceptorError` before `\maketitle*`.
- To change "Thesis Supervisor" to something else use `\SupervisorDesignation{..}`.

Please do not remove the license/copyright text from the sources files — this code took me some time write!

7 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!

ChatGPT. At the time of this writing, ChatGPT, a chatbot based on a large language model, could sometimes accurately answer LaTeX-related questions or write acceptable LaTeX and expl3 code.

Good luck with your thesis and your thesis defense!