

# The MIT thesis template

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## THE MIT THESIS TEMPLATE

This 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 fonts, 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.

### Background

The original MIT Thesis template was written L<sup>A</sup>T<sub>E</sub>X 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. L<sup>A</sup>T<sub>E</sub>X 2.09 was replaced by L<sup>A</sup>T<sub>E</sub>X 2<sub>ε</sub> 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 have changed the required format several times, especially as electronic thesis submission has become 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 The original template served MIT well; but by the early 2020s, it was substantially out of date.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.

### System requirements

The new `mitthesis` class uses the features of L<sup>A</sup>T<sub>E</sub>X as of 2022, with limited backward compatibility. An up-to-date L<sup>A</sup>T<sub>E</sub>X system is therefore necessary when using this template.

L<sup>A</sup>T<sub>E</sub>X is a free, open source system. The entire system is distributed through the T<sub>E</sub>X Live platform (<https://www.tug.org/texlive/>), including the basic format, packages, and user interfaces. The system operates on Windows, MacOS, and Unix/Linux. T<sub>E</sub>X 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 similar functionality.)

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

## L<sup>A</sup>T<sub>E</sub>X engine

The template works with either pdfT<sub>E</sub>X or unicode engines such as LuaL<sup>A</sup>T<sub>E</sub>X. With the latter, fonts that you install in your operating system can be configured for use in your thesis. LuaL<sup>A</sup>T<sub>E</sub>X 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 T<sub>E</sub>X 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.

## 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.

## 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.

## 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 L<sup>A</sup>T<sub>E</sub>X in June 2022. For older versions of L<sup>A</sup>T<sub>E</sub>X, the mitthesis class will fall back to loading the hyperxmp package 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 L<sup>A</sup>T<sub>E</sub>X installation is preferred.

Current L<sup>A</sup>T<sub>E</sub>X 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.

## 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 (e.g., keywords, subject, etc.). These commands generate metadata that are incorporated into the pdf file.

The commands that define the title page are as follow.

- \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 the thesis. If the thesis satisfies two degrees from one department, leave the department argument blank for the *second* degree: `\Degree{2nd degree name}{}`
- `\Supervisor{supervisor name}{supervisor title}`. 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, May, 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/}.
```

### 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 12pt and 18pt skips between the various blocks of text to 6pt 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 2<sup>nd</sup> argument and leaving the 3<sup>rd</sup> 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.

Also, 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 (T<sub>E</sub>X'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.

## PACKAGE OPTIONS

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

### Font loading

By default, `mitthesis.cls` will load the traditional  $\LaTeX$  fonts, Computer Modern (for pdf $\TeX$ ) or Latin Modern (for 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 pdf $\TeX$ , 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. To access the predefined font sets, you *must* have the directory `fontsets` as a subdirectory of your working directory, including its files as named.

Among the predefined 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 19<sup>th</sup> 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 place your own fontset file, say `Myfontset.tex`, in your working directory, and load it with

```
\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.

Table 1: Options to the document class

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

Table 2: Predefined font sets

fontset	pdfT <sub>E</sub> X	unicode	text font	math font	details
fira-newtxsf	yes	no	sans	sans	included in T <sub>E</sub> X Live
newtx	yes	no	serif	serif	included in T <sub>E</sub> X Live
newtx-sans-text	yes	no	sans	serif	included in T <sub>E</sub> X Live
default	yes	yes	serif	serif	CM & LM fonts are included in T <sub>E</sub> X Live
libertine	yes	yes	serif	serif	in T <sub>E</sub> X Live for pdfT <sub>E</sub> X. For unicode, OpenType text fonts freely available here <a href="https://sourceforge.net/projects/linuxlibertine/">https://sourceforge.net/projects/linuxlibertine/</a> and the math font here <a href="https://github.com/alquerque/libertinus">https://github.com/alquerque/libertinus</a>
lucida	yes	yes	serif	serif	the lucida fonts are available from the T <sub>E</sub> X User's Group, <a href="https://tug.org/store/lucida">https://tug.org/store/lucida</a>
heros-stix2	no	yes	sans	serif	<a href="http://www.gust.org.pl/projects/e-foundry/tex-gyre">http://www.gust.org.pl/projects/e-foundry/tex-gyre</a> <a href="https://github.com/stipub/stixfonts">https://github.com/stipub/stixfonts</a> fonts are free
stix2	no	yes	serif	serif	<a href="https://github.com/stipub/stixfonts">https://github.com/stipub/stixfonts</a> , fonts are free
termes	no	yes	serif	serif	<a href="http://www.gust.org.pl/projects/e-foundry/tex-gyre">http://www.gust.org.pl/projects/e-foundry/tex-gyre</a> fonts are free
termes-stix2	no	yes	serif	serif	<a href="http://www.gust.org.pl/projects/e-foundry/tex-gyre">http://www.gust.org.pl/projects/e-foundry/tex-gyre</a> <a href="https://github.com/stipub/stixfonts">https://github.com/stipub/stixfonts</a> fonts are free
Typewriter (monospaced) fonts are also loaded for unicode					Inconsolata (sans serif): <a href="https://ctan.org/tex-archive/fonts/inconsolata">https://ctan.org/tex-archive/fonts/inconsolata</a> Cursor (serif): <a href="http://www.gust.org.pl/projects/e-foundry/tex-gyre">http://www.gust.org.pl/projects/e-foundry/tex-gyre</a>

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.

### 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.

### 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.

## 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 “chapter” or “section” depending on whether you have one nomenclature list for whole thesis or one for each chapter (the default is section).

For example, the following code

```
\begin{nomenclature}[2em][Nomenclature for Chapter 1][section]
\EntryHeading{Roman letters}
\entry{ $\mathcal{C}$ }{material curve}
\EntryHeading{Greek letters}
\entry{ $\Gamma$ }{circulation [ $m^2 s^{-1}$ ]}
\end{nomenclature}
```

produces the nomenclature list below

### Nomenclature for Chapter 1

*Roman letters*

$\mathcal{C}$  material curve

*Greek letters*

$\Gamma$  circulation [ $m^2 s^{-1}$ ]

## PACKAGES FOR MATH, CHEMISTRY, CODE LISTINGS, AND MORE

The `mitthesis` class loads the `amsmath` package and its extension `mathtools`. 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.

The packages called by `mitthesis` are listed in [Table 3](#) on [page 8](#).

## USE OUTSIDE MIT

If you wish 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*`.

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

## RESOURCES FOR L<sup>A</sup>T<sub>E</sub>X

L<sup>A</sup>T<sub>E</sub>X documentation is easy to find online. A few useful resources, among many, are these:

**L<sup>A</sup>T<sub>E</sub>X Wikibook.** <https://en.wikibooks.org/wiki/LaTeX>. An online tutorial book.

**L<sup>A</sup>T<sub>E</sub>X2e: An unofficial reference manual.** <https://latexref.xyz/dev/latex2e.html>. A comprehensive explanation of each L<sup>A</sup>T<sub>E</sub>X command, from the T<sub>E</sub>X User’s Group.

**T<sub>E</sub>X 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 both answer some L<sup>A</sup>T<sub>E</sub>X-related questions and write acceptable L<sup>A</sup>T<sub>E</sub>X and expl3 code.

***Good luck with your thesis and your thesis defense!***

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

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