

# The *new* MIT thesis template

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## The MIT thesis template

L<sup>A</sup>T<sub>E</sub>X has changed tremendously since the original MIT thesis template was written in the 1980s. 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 the 1994. Many packages and fonts were developed to accompany the original platform, particularly after 2000; and major updates to the L<sup>A</sup>T<sub>E</sub>X kernel began in 2018. Further, 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 The original template served MIT well, but by the early 2020's, it was substantially out of date.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 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 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, 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.

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 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 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.

**Overflowing title page.** 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}`. You may also compress the acceptor fields by putting the position into the 2<sup>nd</sup> argument and leaving the 3<sup>rd</sup> argument blank: `\Acceptor{acceptor name}{acceptor title and thesis related position}{}{}`.

## 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   |
|-----------------------|--|
| <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.   |

## Font loading

By default, `mitthesis.cls` will load the traditional  $\text{\LaTeX}$  fonts, computer modern (pdf $\text{\TeX}$ ) 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 pdf $\text{\TeX}$ , 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.

Among these fonts, Termes and NewTX are serified 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 serified 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 “ $\text{\LaTeX}$  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

```
\documentclass[fontset=Myfontset]{mitthesis}
```

## Design options

The thesis will follow the default styles of the  $\text{\LaTeX}$  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.<sup>1</sup>

<sup>1</sup>If you are using different style files, say `styleA.tex` and `styleB.tex`, you can switch between them with the options

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/alserque/libertinus">https://github.com/alserque/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><br>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>  |

## 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 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 `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 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.

[`mydesign=styleA`] and [`mydesign=styleB`].

## 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.

## 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 (default = section).

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*

$\Gamma$       circulation

## 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>X2<sub>ε</sub>: 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!

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   |
|--------------|---|--|
| bookmarks    | is loaded automatically under the new pdf-management system   | —  |
| doi          | support for hyperlinking DOIs                                 | hyperlink a doi number: <code>\doi{. .}</code>   |
| etoolbox     | extend or modify other macros                                 | can use in preamble if needed  |
| iftex        | check which L <sup>A</sup> T <sub>E</sub> X engine is running | macros to check engine   |
| ifthen       | streamlined conditionals                                      | can use in preamble if needed  |
| geometry     | set page size and margins                                     | can use <code>\newgeometry</code> in <code>mydesign.tex</code>   |
| graphicsx    | support for inserting images                                  | use to include graphics  |
| hyperref     | support for hyperlinks and metadata                           | must complete setup in preamble  |
| hyperxmp     | fallback if no <code>\DocumentMetadata{. .}</code>            | —  |
| kvoptions    | key values for systems pre 2022/11/01                         | —  |
| mathtools    | loads and extends amsmath                                     | <b>many useful math macros available.</b> 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 <code>lineno</code> will give line numbers; <code>lineno</code> package has additional commands that control line numbering |
| caption      | also loaded by <code>mydesign.tex</code>                      | support for caption styling  |
| subcaption   | also loaded by <code>mydesign.tex</code>                      | support for subfigures within figures  |
| titlesec     | also loaded by <code>mydesign.tex</code>                      | support for styling section headings   |
| xcolor       | also loaded by <code>mydesign.tex</code>                      | support for colors, including colored fonts  |
| babel        | —   | if you use multiple languages, load <code>babel</code> in a fontset file before loading fonts  |
| biblatex     | —   | sample template uses this bibliography tool. Change to <code>natbib</code> if you prefer   |
| fontenc      | —   | load this in a fontset file if using pdfT <sub>E</sub> X   |
| fontspec     | —   | load this in a fontset file if using a unicode engine (unicode-math loads <code>fontspec</code> 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   |