FRIthesis, the University of Ljubljana, Faculty of Computer and Information Science LaTeX class

Acknowledgements *I sincerely thank the deans of the Faculty for having the guts for a drastic change in the requirements regarding the typesetting of the doctoral dissertation. It was about time. At last there is a stylistic common denominator and the published works will look professionally executed. As the dissertation is the culmination of the hard work you have put in in the last few years, you should be proud. The look and feel of the published work will surpass those submitted to the most renowned universities. My special thanks therefore go to those not used doing it in LaTeX, give it a chance, you might discover entirely new sensations and find out it is fun doing it this way as well.*

Contents

Introduction

What is in front of you is the XeLaTeX class that allows typesetting the doctoral dissertation in compliance to the new typesetting rules set by the Faculty of Computer and Information Science. This document serves as a short introduction to the class, listing the special requirements of the class and trying to expose the all-important final touches that will allow you to produce a work that you will be rightfully proud of.

Be advised that the class is still under development so expect minor changes between releases.

Prerequisites

You should make sure that you have the latest version of your LaTeX 2_ε distribution installed and that all of the pre-installed packages are up to date. If you are using a Microsoft Windows system this means the MikTeX[1] 2.9 LaTeX 2_ε distribution.[2] The

[1] miktex.org

[2] At the time of writing this documentation.

choice of a suitable editor depends on personal preference, but you might try TeXstudio,[3] TeXnicCenter,[4] or simply use the default editor that comes with the MikTeX distribution.

As the class uses specific OTF typeface files, the TEX documents have to be compiled to PDF using XeLaTeX and not pdfLaTeX or LaTeX. All other requirements (e.g. multiple compilations to get citations and references synchronized...) are the same as for all LaTeX based documents.

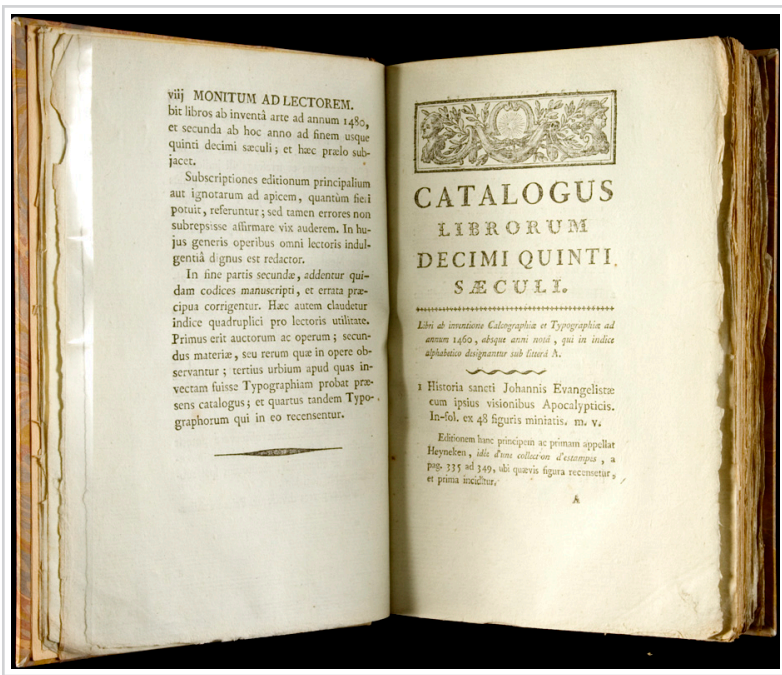
The story behind the design

When I first approached the challenge of creating a new design for doctoral dissertations of the Faculty of Computer and Information Science, I decided it should advertise science, excellence and clarity. It should advertise the new DOCTOR OF PHILOSOPHY and symbolise the act of their ***Alma Mater*** releasing them from its protection.

You might ask yourselves why the cover page lists merely the title and the author. Well, because this is the most important information of all; the new DOCTOR OF PHILOSOPHY and the title of their doctoral dissertation. The institution, their ***Alma Mater***, is confidently giving them credits and letting them step out of its shadow, placing emphasis on them (front of the book cover) rather than the institution itself (moving to the back of the book cover). The spine of the book cover contains merely the title of the dissertation and cryptic information about the year, the department (its acronym) and the serial number of the dissertation.

The three concepts (science, excellence and clarity) drove the design of the page spread, colour scheme and the choice of type families. I started by inquiring: when was science real science, when did it all begin? Research led me to the mid-1500s, when scientists began to question accepted beliefs and make new theories based on experimentation; the roots of all modern science. It was the Renaissance era (1300–1600, a time of great changes in Europe). Some of the greats that lived and questioned in that period were Nicolaus Copernicus, Galileo Galilei, Isaac Newton, Leonardo da Vinci, to name just a few. Sometime in that period, in 1455 to be precise, the Gutenberg Bible, or B42, was printed. This is the first major book printed with movable type marking the age of the printed book in the West. Widely praised for its high aesthetic and artistic qualities, the book has an iconic status.

[3] texstudio.org
[4] texniccenter.org



viij MONITUM AD LECTOREM.

bit libros ab inventâ arte ad annum 1480, et secunda ab hoc anno ad finem usque quinti decimi sæculi; et hæc prælo subjacet.

Subscriptiones editionum principalium aut ignotarum ad apicem, quantùm fieri potuit, referuntur; sed tamen errores non subrepsisse affirmare vix auderem. In hujus generis operibus omni lectoris indulgentiâ dignus est redactor.

In fine partis secundæ, addentur quidam codices manuscripti, et errata præcipua corrigentur. Hæc autem claudetur indice quadruplici pro lectoris utilitate. Primus erit auctorum ac operum; secundus materiæ, seu rerum quæ in opere observantur; tertius urbium apud quas invectam fuisse Typographiam probat præsens catalogus; et quartus tandem Typographorum qui in eo recensentur.

CATALOGUS
LIBRORUM
DECIMI QUINTI
SÆCULI.

Libri ab inventione Calcographiæ et Typographiæ ad annum 1460, absque anni notâ, qui in indice alphabetico designantur sub litterâ A.

1 Historia sancti Johannis Evangelistæ cum ipsius visionibus Apocalypticis. In-fol. ex 48 figuris miniatis. m. v.

Editionem hanc principem ac primam appellat Heyneken, *idée d'une collection d'estampes*, a pag. 335 ad 349, ubi quævis figura recensetur, et prima incidtur.

A

François Xavier Laire, *Index librorum ab inventa typographia ad annum 1500; chronologice dispositus cum notis historiam typographico-litterariam illustrantibus*. Senonis: apud viduam et filium P. Harduini Tarbe, 1791.

J. A. Van de Graaf, whilst studying B42 and other Gutenberg's books, discovered that they all followed *some* system in determining the position and size of the body text. In the field of book design the ways that page proportions, margins and type areas (print spaces) of books are constructed are governed by The Canons of Page Construction. Van de Graaf, based on his research, devised a geometrical solution, which works for any page width:height ratio and enables the book designer to position the body text in a specific area of the page. Using the canon, the proportions are maintained while creating pleasing and functional margins of size 1⁄9 and 2⁄9 of the page size. In addition, the height of the body text equals the width of the page. The extra wide outside and bottom margins provide ample space for comfortably holding the book without covering the body text; they also provide ample space for writing notes,[5] something that is to be expected in a proper scientific work. The canon, first discovered by Van de Graaf, was later reinterpreted by contemporary designers like Villard de Honnecourt, Raúl Rosarivo and Jan Tschichold.

The page spread design of the Faculty of Computer and Information Science dissertations now follows Van de Graaf's canon of page construction, thus putting you on par with all the greats of the Renaissance, Scientific Revolution era. Act responsibly.

The front page of the book cover

The cover page design is personalized and different for every dissertation; a huge improvement over the boring covers that listed just the institution, title and author. This special treat does however come with responsibilities. You the author are required to find a suitable figure, image, illustration that best describes the essence of the work. This is the front-end to the user—the reader—you should provoke thoughts, intrigue, raise a question all in favour of making the reader want to open the 1 kg of paper and start reading.

The same minimal standards as for figures are required. In case of a raster graphics image this should be at least 300 dpi (600 dpi preferred) and in case of a vector graphics figure or illustration, this should be well designed and in 1:1 ratio. The expected aspect ratio of the supplied graphics is 2:3 (width:height). The cover page dimensions are 181×272 mm, at 300 dpi this is 2141×3212 px. A large enough portion of the image, figure or illustration should be white space (i.e. space with subdued colours or single colour) to aid readability when placing the title and author information. This should

[5] Christopher Columbus's notes on the margins of his copy of *The Travels of Marco Polo*—wikipedia.org.

reside approximately 35 mm below and left from the top right corner (above and left from the bottom right), or 20 mm to the right and 35 mm below (above) from the top left corner (from the bottom left corner).

In case of using copyrighted images, the appropriate permissions must be obtained from the author(s). A good source of professional quality raster graphics images as well as vector graphics figures and illustrations are stock photo databases like Corbis,[6] Shutterstock,[7] Dreamstime,[8] iStockphoto[9]... in some cases royalty free. Do check them out, especially as you can search by key words, thus also providing for inspiration in case you venture into self-production of the cover page image, figure or illustration.

Typography

The aesthetics of body text and mathematics follow the design rules set by the University of Ljubljana. You might have noticed that the supporting graphical elements follow those rules as well. The body text and mathematics are set in the EB Garamond type family, a type family designed by Georg Duffner[10] that supports advanced features (ligatures, small caps, old-style numerals, superscripts...) and is closer to the original type designs used by Claude Garamond (ca. 1490–1561) than the typeface used by the University of Ljubljana.

The otf files containing the EB Garamond type family typefaces are located in the fonts/ directory. This is a typeface that is distributed under the Open Font License, but is still under development.[11] The version included in the fonts/ directory is 0.016; it provides two optical sizes 8 pt and 12 pt in regular, *italic* and small caps, as well as a subset of specially designed decorative initials.[12]

You might have noticed in this document already that body text numerals are old-style figures 0123456789, these blend in well with the optical flow and rhythm of the lower-case alphabet. Mathematical equations use lining figures 0123456789, thus in tex language $1 \neq 1 (i.e. $1 \neq 1$).

[6] corbis.com
[7] shutterstock.com
[8] dreamstime.com
[9] istockphoto.com
[10] georgduffner.at
[11] bitbucket.org
[12] Jure Demšar's doctoral disertation using decorative initials—eprints.fri.uni-lj.si.

In the body text only the regular, *italic* and SMALL CAPS styles are available and allowed to be used. The **bold** style is not included as v0.016 of the EB GARAMOND type family typefaces does not provide a hand designed bold variant. Furthermore the decision to disallow the use of the bold style in the body text was made as most of the typographically inexperienced users choose this style too frequently or use it inappropriately. Frequent use of the bold style in the body text influences the type colour, making it non-homogeneous. The writer's intent to aid the reader comprehend has the contrary effect hindering the reader's ability to read. When trying to emphasise certain parts of your body text use *italic* `\emph{}`, or SMALL CAPS `\textsc{}` instead.

A totally different ball game is the typesetting of mathematical equations. They, with the proper notation, which includes the **bold** and perhaps even the ***bold italic*** style as well, become easier if at all understandable. This is why the bold and bold italic styles are allowed in mathematical equations. At the present time mathematics is set in a mixture of EB GARAMOND for numbers, lower- and upper-case Latin and Greek, whereas symbols are set in XITS MATH,[13] a special typeface that is distributed under the Open Font License. In addition the class pre-loads the `amsmath` and `unicode-math` LaTeX packages thus providing additional mathematical symbols and giving you the ability to typeset mathematical equations in Unicode. Styles available are regular `\mathrm{}`, *italic* `\mathit{}`, **bold** `\mathbf{}` and ***bold italic*** `\mathbfit{}`. Note that the bold and bold italic style are not set with hand designed typefaces, but rather with versions faked from the regular and *italic* typefaces. Note also that v0.016 of the EB GARAMOND type family typefaces provides Greek letters in regular $\alpha\beta\gamma\delta\varepsilon\ldots$ and italic $\mathit{\alpha\beta\gamma\delta\varepsilon\ldots}$ only for optical size 12 pt. The 8 pt optical size does not provide Greek letters in italic, so by forcing the use of italic for Greek letters you might experience disparaging letter forms.

Listings and verbatim code usually require `monospace` typefaces. At the present time these are typeset using the SOURCE CODE PRO type family typefaces designed by Paul D. Hunt for Adobe and distributed under the Open Font License. Styles available are `regular`, *`italic`*, **`bold`** and ***`bold italic`***. As SOURCE CODE PRO was designed as a companion mono spaced version of the sans serif typeface SOURCE SANS PRO the latter was selected as the primary sans serif typeface. Styles available are regular, *italic*, **bold** and ***bold italic***.

[13] fontlibrary.org

Figures

The body text dimensions are approximately 100×150 mm (width×height), so all images should be kept within this dimensions. The preferred aspect ratio is 3:2, which gives you 100×67 mm for a landscape figure. All figures are framed with a 5 % grey 1 pt wide frame and 2.5 pt inner margins.

As figures use side captions special care needs to be taken when writing them. The space available for the caption needs to be taken into account. A small figure might not provide enough space for a long caption. These types of events can be easily solved by rethinking the figure or adding an invisible background to the figure, which will provide enough space for the caption in question.

Images and other raster graphics must have a resolution of at least 300 dpi, thus measuring at least 1182×787 px for a landscape figure, and should be saved in the PNG file format. A resolution of 600 dpi is preferred.

All figures should be produced in vector graphics editing software like Adobe Illustrator, Corel Draw, Inkspace... in a 1:1 ratio (i.e. requiring no scaling at the time of import) and exported in the EPS or PDF file format. The figures should be aesthetically consistent, use the same typeface and colour palette throughout. Suitable typefaces are Adobe Source Sans Pro, Helvetica, Arial, and in case of mathematical equations and symbols the already mentioned Math Asana all in a 7–9 pt type. Refer to THESIS-DEMO-PALETTE.PDF for an example of a suitable palette. A good source of palettes is Adobe Kuler[14].

Note that XeLaTeX might have issues importing EPS files; the figures might end up disappearing from the page entirely or be placed in the wrong place. The issue can be easily solved by converting the EPS file to PDF. This can be done from the command line by calling `epstopdf <filename.eps>` a command that is available in all LaTeX distributions.

Dissertation structure

The revised doctoral dissertation structure is as follows:

+ Title page,
+ Duplicate title page with required logos,

[14] kuler.adobe.com

+ Approval page,
+ Previous publications page,
+ Dedication,
+ Table of contents,
+ Dissertation body,
+ Appendix,
+ Bibliography,

Currently unsupported.
+ Glossary,

Currently unsupported.
+ Index.

Except for the Table of contents no additional lists, like the list of figures or list of tables, should be included. The Index, Glossary and Dedication parts are optional. Similarly the Appendix part is optional as well, except for dissertations written in English. In this case it is mandatory and should, by requirement, include an Appendix titled ***Razširjeni povzetek*** that covers at least 10 % of the material discussed in the dissertation body. Optionally additional appendices can exist. The Duplicate title page is required only for funded doctoral dissertations. As funded young researchers are legally bound to provide information about the funding sources it typesets a duplicate Title page and places all of the required logos in the page header.

Thesis-demo

The tex files starting with thesis-demo provide you with an example of a doctoral dissertation prepared with this LaTeX class. They can serve you as a starting point. The most important files of all are thesis-demo.tex and thesis-demo_cover.tex; the former is used to produce the main body of your dissertation, the latter to produce its cover. They start by loading the FRIthesis.cls LaTeX class with the appropriate options. They then proceed by specifying the *title*, *key words*, *advisor*, *co-advisor*, the *approval committee members*... The class commands used to specify the listed parameters are documented in the files themselves and since the class file is still under development this document will not explain them further.

After the initial setup a number of helper commands that are to be used in the remaining part(s) of the document are defined. The body of the document is enclosed between the commands `\begin{document}` and `\end{document}`. Files included with the command `\input{<filename>}` represent sub-parts (chapters) of the dissertation. I strongly advise using this type of tree structure as it makes the document

much easier to manage. It also simplifies compilation as it allows excluding certain subparts when they are not the ones being worked on. Everything else should be quite self-explanatory. Whenever you have trouble typesetting parts of your dissertation, you can use THESIS-DEMO as a reference point.

Preparing to print

A typical doctoral dissertation has several production stages, namely ***dissertation proposal***, ***draft***, ***revised***, ***proofread***, ***final***. The preparation of the dissertation proposal is currently unsupported, however, the LaTeX class can be easily used throughout all of the other stages. In some cases the draft can be preceded by an ***early draft*** version, and the revised and proofread stages can have multiple occurrences. From the LaTeX class perspective there is no real difference. The stages are more or less merely a good practice in the preparation of a doctoral dissertation or any other manuscript.

The same set of LaTeX class options can be used throughout all of the production stages except for the final stage. In the final stage, i.e. when the dissertation has been revised and proofread, you will prepare two PDF versions. One that is to be published on the Faculty of Computer and Information Science web site and one that is to be printed, either by you or by the bookbinder who will make the hardcover, hardbound book. The latter edition, the PDF version that is to be printed either by you or the bookbinder, requires the option `press`. The option inserts all of the necessary information that will aid the bookbinder to correctly trim the book block. This option must not be used for the former edition, i.e. when preparing the PDF version that is to be published on the Faculty of Computer and Information Science web site. When preparing each of the two final PDF versions make sure to run them through XeLaTeX a couple of times and check for any possible issues (see THESIS-DEMO.PDF and THESIS-DEMO_PRESS.PDF for reference).

If you decide to leave printing to the bookbinder, you will need to give them two PDF files, one with the main body (see THESIS-DEMO_PRESS.PDF for reference) and one with the cover page (see THESIS-DEMO_COVER.PDF for reference). If you, however, decide to print the main body of the dissertation yourself, you will require a ***colour laser printer*** capable of ***double sided*** printing and enough sheets of 100 g/m^2 paper. When printing, make sure that you disable any page scaling and enable central placement of the page. Translated to Adobe Acrobat X speak this means selecting Size > Actual Size, Auto portrait/landscape in the Page Size & Handling

section of the Print dialogue box. The cover page will still need to be printed by the bookbinder, as it requires an A3 colour laser printer, special paper and a further step of plastic lamination.

The bookbinder is Grafika Bonifer, all additional information can be found on their web site.[15]

For all other production stages, which require printing and the production of a soft-bound (spiral binding) edition the option `press` should not be used. When printing you should instead, make sure to scale the page to A4. Translated to Adobe Acrobat X speak this means selecting Size > Fit, Auto portrait/landscape of the Page Size & Handling section in the Print dialogue box. This will produce an approximately 28 % larger page, thus further aiding in late night readability of the manuscript. This will mostly help you, as your reviewers might consequentially show more mercy.

[15] bonifer.si