The `ubcthesis` Package*

2002/12/15

Contents

*This is ubcthesis.dtx version v1.19 dated 2002/12/15. CVS *Revision* : 1.19

1 Introduction

The `ubcthesis` class is a package designed for LaTeX2e to aid students at The University of British Columbia (UBC) in Vancouver, British Columbia, Canada in writing theses that conform the the format requirements of the library. The output of the sample file has been checked and approved by the library, but this class is presently un-official (see section 2).

This class is quite general and contains many options. Hopefully, there are enough options so that you will be able to use it to format a thesis at another institution. If not, please let me know so that I may modify it (I will send you an updated version as soon as possible). See also Section 6.

2 Disclaimer

The `ubcthesis` LaTeX class and the accompanying sample files are *unofficial* and are not supported by The University of British Columbia. While I have attempted to make the style file and sample files conform to all of the requirements set forth by the Special Collections department of the library, you should always consult one of the Special Collections staff for assistance with problems *before* starting final draft. You should be able to find the thesis requirements at one of the following sites:

- `http://www.library.ubc.ca/`
- `http://www.library.ubc.ca/spcoll/`
- `http://www.library.ubc.ca/spcoll/theses.html`
- `http://www.library.ubc.ca/spcoll/thesesin.html`
- `http://www.grad.ubc.ca/`
- `http://www.grad.ubc.ca/currstudents/`
- `http://www.grad.ubc.ca/currstudents/records/thesis.htm`

3 Version

This section describes the version information for this file. It is maintained through a CVS repository and by manual version numbers. These should be kept in sync, however, this file might be modified outside of the CVS archive, in which case the versions might differ.

CVS Version: `Id: ubcthesis.dtx,v 1.19 2004/02/04 23:20:09 mforbes Exp`

Manual Version: ubcthesis.dtx v1.19 2002/12/15.

4 Getting Started

This section describes how to get up and running with the `ubcthesis` class. You should make sure you have all the files, then unpack them and use the sample thesis as a guide to formatting your own thesis.

4.1 Obtaining the `ubcthesis` package

package, however, if not (perhaps this document has been posted without the full package) then please check the following places which may have a reference to the complete package (at the time of writing, the final location of the package is not known).

- `http://www.physics.ubc.ca/`
- `http://www.library.ubc.ca/`

Also see the library locations listed in Section 2 as these should contain a link to the package.

The complete package should be called `ubcthesis.tgz` or `ubcthesis.tar.gz` or `ubcthesis.zip` or the similarly depending on how it is packaged and includes the files:

`ubcthesis.dtx` This file contains the `ubcthesis.cls` class as well as a sample thesis and all of the documentation. It can be processed with LaTeX to generate the documentation (see Section 4.2.1).

`ubcthesis.ins` This file is a script that unpacks the `ubcthesis.dtx` file. It should be processed with LaTeX.

`fig.eps` This file is a sample figure for inclusion with the sample thesis.

`fig.fig` This file is the `xfig` source for the `fig.eps` file.

4.2 Installing the `ubcthesis` package

To install the `ubcthesis` package you must have a working version of LaTeX installed on your system. The LaTeX program can them be used to generate the appropriate files and documentation. It is recommended that you copy all the files `ubcthesis.dtx`, `ubcthesis.ins`, `fig.eps` and `fig.fig` to a temporary directory first. The rest of the installation instructions will assume that you have done this.

4.2.1 Documentation

To generate the documentation, run the following commands:

```
latex ubcthesis.dtx
makeindex -s gglo.ist -o ubcthesis.gls ubcthesis.glo
makeindex -s gind.ist ubcthesis.idx
latex ubcthesis.dtx
latex ubcthesis.dtx
```

Running LaTeX three times is required to properly generate the cross-references. The makeindex program generates the index and change logs. This will produce the file `ubcthesis.dvi` which can then be viewed with the `xdvi` program:

```
xdvi ubcthesis.dvi
```

In addition, the usual auxiliary LaTeX files will be produced. These may be discarded. Copy the documentation file `ubcthesis.dvi` to an appropriate location for future references.

4.2.2 Generating the `ubcthesis.cls` file

To generate the actual `ubcthesis.cls` file and the sample thesis, run LaTeXonce on the `ubcthesis.ins` file:

```
latex ubcthesis.ins
```

This will generate the following files:

`ubcthesis.cls` This is the actual `ubcthesis` class file.

`ubcthesis.drv` This is a driver file used to unpack the other files. It may be safely removed.

`ubcthesis.log` This is a log of what happened during the unpacking. If you have problems, you might check this, but it may not be easy to read. It may be safely removed.

`sample.tex` This is the sample thesis file.

`sample.bib` This is a sample BIBTeX bibliography database for the sample thesis.

The sample thesis files should be moved to the same directory as the documentation files as they are very useful for someone writing a thesis. *These should be used as a template because they conform to the UBC thesis requirements.*

4.2.3 Sample Thesis

The sample thesis consists of the files `sample.tex` and `sample.bib`. It is setup to conform with the UBC standard and *should be used as a template* because it specifies the correct order of elements such as the abstract, table of contents etc. It also contains many examples of LaTeX features. To compile it, use the following commands:

```
latex sample
bibtex sample
latex sample
latex sample
```

The first time, a list of references will be produced in the file `sample.aux`. Also, the list of tables `sample.lot` and list of figures `sample.lof` will be produced. The BIBTeX program will then use this and the list of bibliographic information in `sample.bib` to produce a properly formatted bibliography in `sample.bib`. The final calls to LaTeX will arrange all the cross-references correctly.

View the sample thesis using `xdvi`:

```
xdvi sample.dvi
```

The actual class file `ubcthesis.cls` must be installed somewhere that LaTeX can find. This should be on the TEXINPUTS path. Check with your system administrator for the correct location. It is likely somewhere like:

```
/usr/local/texmf/
/opt/local/teTeX/share/
```

Optionally, you can simply put a copy in the same directory as your thesis.

Be sure that when you distribute your thesis, you also include the `ubcthesis.cls` file (and preferably the entire `ubcthesis` distribution!) since it is not yet a standard LaTeX package.

5 Writing a Thesis

To begin writing a thesis using the `ubcthesis` class, you should start with the sample thesis as a template. In particular, the sample thesis shows you how order various sections and to ensure that pages are numbered appropriately. In addition, many useful options are demonstrated here.

This sections describes how you can use the `ubcthesis` class to accomplish various tasks.

5.1 Page Style

You may wish to change the way that you pages look in your thesis. This section describes how to do this.

5.1.1 Headers and Footers

The terms "headers" and "footers" refer to text that appears at the top and bottom of the page. The `norunningheaders` option can be used to suppress the display of a header, and the `noheadline` option can be used to suppress the line drawn under the header.

To further customize the appearance of the headers and footers, use the `fancyhdr` package. This gives you much more control over the headers. See the documentation supplied with the `fancyhdr` package for more details.

If you do decide to define your own headers, be careful about page numbering: you may need to explicitly include a page number in your header to ensure that each page is numbered.

5.2 Class Options

Most of the bevahiours of the `ubcthesis` class are controlled through flags that are set in the `\documentclass[]{ubcthesis}` statement that occurs at the start of your document. Options are specified in the square brackets, for example the sample file uses the options msc, 10pt, noupper, appendixpart, and oneside.

Options usually appear in pairs that enable or disable a feature. As the `ubcthesis` class was derived from the standard book class, many of the options are still supported. In this section we describe all options that are different from the standard LaTeX `book` class and a few of the relevant options that have been maintained. The default option values are underlined.

`draft` `final` **draft/<u>final</u>** These toggle between draft and final modes. Use the final mode for submission. Note: in the draft version, graphics are not necessarily displayed depending on the graphics package you use.

`10pt` `11pt` `12pt` **<u>10pt</u>/11pt/12pt** Sets the font size.

oneside
twoside

<u>oneside</u>/twoside Single verses double sided. This just offsets the pages: you must specify to print (for example, use the command `lpr -Zsimplex ...` for one side or `lpr -Zduplex ...` for two). If you are handing in your thesis single sided (the current requirement) then be sure to use the oneside option.

upper
noupper

upper/<u>noupper</u> Upper case chapters and part headings.

tocupper
notocupper

tocupper/<u>notocupper</u> Upper case in the table of contents.

chapterheads
nochapterheads

<u>chapterheads</u>/nochapterheads Display "Chapter #" before chapter titles in the main matter of the thesis.

headcount
noheadcount

<u>headcount</u>/noheadcount Toggles the display of the numbers in chapter headings.

msc
ma
masc
meng
phd

msc/ma/masc/meng/<u>phd</u> Sets the style. Sets degreetitle to "DOCTOR OF PHILOSOPHY", "MASTER OF SCIENCE" etc. in the title page. The number of signature lines is also changed.

appendixpart
noappendixpart

appendixpart/<u>noappendixpart</u> Specifies that the appendix should be a part rather than a chapter.

appendixpage
noappendixpage

appendixpage/<u>noappendixpage</u> Puts a page separator between the appendices. Has no effect if the option "appendixpart" is specified since parts are already put on a separate page.

hangingcaptions
nohangingcaptions

hangingcaptions/<u>nohangingcaptions</u> These options determine whether or not figure and table captions should "hang". Hanging captions are justified so that all the caption text comes after the caption label.

runningheaders
norunningheaders

<u>runningheaders</u>/norunningheaders These display or suppress running headers that contain the current chapter name and number. If they are suppressed, only the page number will be displayed.

headline
noheadline

<u>headline</u>/noheadline These display or suppress a horizontal line running under the headers at the top of the page.

crosshair
nocrosshair

crosshair/<u>nocrosshair</u> These toggle between crosshair and nocrosshair modes. The crosshair mode puts a large X on empty pages. (Pages with pagestyle *empty*).

committee

committee Use this option when producing the version to send to your thesis committee if they want the document with 1.5 spacing so there is some room for comments between the lines. You may change the spacing by redefining the `\committeespacing` command in the preamble (before the `\begin{document}` command). The following command would give double spacing for example.

```
\renewcommand{\committeespacing}{2}
```

6 Contributions

While this class attempts to conform to the requirements of UBC, I have attempted to make it very general so that it will be of use for anyone writing a thesis. In particular, I have included many options that can be changed to meet the specific requirements of a given university. Ultimately, I would like to include several "global options" that would change the format to conform with various universities. These would work in much the same way that the various Font Options (see Section 21.16): each global option would set a bunch of options and variables to make the style conform to the universities requirements.

An additional type of modification would be to add a variety of title page formats (see Section 25.1). There are also many features that could be added which I have not had the time to research and implement. One would be an easy method for including custom counters (such as provided by figures and equations). One specific request is for a "Scheme" counter which would count chemical schemes or formula. This would allow users to produce a "List of Schemes" much as a list of tables and list of figures is currently produced. See Section 7 for a list of tasks.

I would appreciate any feedback, including comments, suggestions, modifications etc. In particular, I would like to know of any features that you require that are not available with the current set of options. Also, if you have a font scheme that looks good, please let me know so that I can include it (I have not spent a whole lot of time thinking about the beast choice of layout as I have had a thesis to write too!)

Michael McNeil Forbes mforbes@physics.ubc.ca

7 To Do (including bugs)

Update Font Options The default font options look okay, but the others (slanted for example) look pretty bad. These should be updated.

Custom Lists Currently, counters are provided for Figures and for Tables that are recorded in `.lof` and `.lot` files respectively for later inclusion in a List of Figures via the `\listoffigures` command and `\listoftables` commands respectively. I would like to provide a way for the user to define custom counters and similar tables for various other types of lists. In particular, a request has been made for a "List of Schemes" allowing chemists to list chemical formulae.

One easy way of doing this would be to provide a set of a fixed number of lists (perhaps with associated files `.lo1`, `.lo2`, ..., `.lo9`) that the user can use and provide customized titles. A better way would probably allow the number to be flexible.

List of Prior Publications There is no explicit way for doing this yet. The library would prefer that this is not included, but some people like to include this information in the thesis, so a nice mechanism should be produced for doing this. This is not hard and can be easily done "by hand".

Wide Text A small environment should be made which allows equations or other elements to be inserted which extend beyond the width of the text for occasional equations etc. that are long. This should justify the wide text properly and center it on the page (possibly including an option for the width of the box and options for flush left, right etc. with the box centered on the page).

Indices I have never worked with indices, so I have no comments on how to do this (nor have I designed the package with this in mind). Many people would probably like to include an index, and so I should include instructions on how to. I will when I figure it out...

Proper Placement of Commands In order to ensure that the `ubcthesis` class works well with other packages, it should be more careful about where various code elements are placed.

One particular problem related to a conflict with the `natbib` package was resolved in Section 26.2 by using the `\AtBeginDocument{` command. In particular, `natbib` redefined the `thebibliography` environment and caused a problem. Now we redefine the `thebibliography` environment after the preamble. This may defeat some of the point of using the `natbib` package but allows us to work now. Problems like this should be investigated and a good resolution found.

`hyperref` **Package** There are problems with the `hyperref` package and index entries when producing the documentation. There was also a problem with `hyperref` in the actual class with the table of contents, but this has been resolved. In the future note that one must be careful where one converts things to upper case: doing so where the toc was written created problems with the hyper-link information. Now the conversion happens before the hyper-links are added.

When this is fixed, include the index and instructions on how to make the index.

Section Numbering The `\@headingalignment` command affects something adversely, but I cannot remember what. This should be tested and the bug fixed.

Draft Headers The Headers in draft mode should still have the page numbers on the right hand side. There is a discrepancy between the abstract page etc. and the rest of the document.

Magic Numbers Many of these have been replaced, but there are still many magic numbers that should be replaced by modifiable constants.

Title Pages Possibly options for uppercase, or add some other styles for the titlepage.

Page Numbering Make the page numbering scheme more flexible. In particular, consider suppressing the counting of certain pages (such as the authorization form) rather than hard setting the numbers.

Lettered Figures Add options for lettered figures.

Table Of Contents If there are a very large number of sections, then the numbers in the toc become large than the space allocated for them. (For an example of this, see the table of contents for this file!) Ideally, when running, the size of the maximum label should be calculated and this used to set the spacing. This could be sent to the .aux file or possibly computed ahead of time.

Page Breaks Add ability to break pages in weird locations. (See Darren Peets class).

Acknowledgements Add a place to acknowledge people who contribute to the project in the documentation!

Chapter Headlines The first page of a chapter now returns to the pagestyle `plain` which is the default behaviour for the LaTeX classes. An option should be added which allows one to customize the chapter page style to give the option of running headers as before.

Draft Mode It might be useful to have a draft mode which includes graphics (because this also includes the current date). Also, if it does not break anything, a CVS revision number should be included in the draft header as well. Draft mode might also force a header onto every page.

Change Log Ordering/Index Presently the change log is not sorted very well in that version 1.2 is really below 1.12. The former should probably be changed to 1.02 etc. Also, the styles etc. should be updated, and the calls to `makeindex` should somehow be automated if possible. Finally, the index should actually link to the pages if possible (with hyperref?) so that modern version of xdvi etc. will allow you to click and go to the relevant pages.

If there are any other features or bugs you would like to see, please let me know (see Section 6).

8 Acknowledgements

This class was derived from `classes.dtx` Version 2001/04/21 v1.4e which is part of the LaTeX base system. The original file is available from

- `http://www.ctan.org`

For information on the LaTeX project, see

- `http://www.latex-project.org`

Additional modifications we incorporated from the thesis.cls file by Wenzel Matiaske The incorporations were made from Version 1996/25/01 1.0g. The `thesis.cls` and `thesis.dtx` distribution is available from.

- `http://www.ctan.org`

I would like to especially thank the following people for contributions:

- Darren Peets for helping debug the class and offering many useful suggestions.
- James P. Zibin for suggesting the fix for the header overflow bug.

Description of the files

From here on, this document describes the actual source files produced line by line. The following files are described:

`ubcthesis.drv` This is the documentation driver file that produces the documentation (which you are probably reading). This must come first because it includes the `\documentclass` statement for this file.

`sample.tex` This is the sample thesis. Use this file as a template for your thesis.

`sample.bib` This is a sample bibliography database (in BIBTeX format) to show you how to use one.

`ubcthesis.cls` This is the actual `ubcthesis` LaTeX2e class file. Look here for specific details about the class, especially if you want to modify or contribute to it.

9 The docstrip modules

The following modules are used in the implementation to direct DOCSTRIP in generating the external files:

ubcthesis	produce the documentclass ubcthesis
sampletex	produce the sample LaTeX file
samplebib	produce the sample BIBTeX file
driver	produce a documentation driver file

File I

Documentation Driver

This bit of code contains the documentation driver file for TeX, i.e., the file that will produce the documentation you are currently reading. It will be extracted from this file by the DOCSTRIP program.

Here is the comment that tells DOCSTRIP to put the rest of the code into `ubcthesis.drv`

```
⟨*driver⟩
```

10 Identification

This section identifies the version of the file. It also indicates which version of LaTeX (LaTeX2e) is required and makes sure that an appropriate message is displayed when another TeX format is used.

```
\NeedsTeXFormat{LaTeX2e}[1995/12/01]
```

Now we announce the file or class name and its version:

```
\ProvidesFile{classes.drv}[2002/12/15 v1.19 ^^J
 University of British Columbia Thesis Class Documentation Driver]
```

11 Document Class

Now we specify the documentclass to use the `ltxdoc.cls` file. This will format the documentation appropriately. This must be the first uncommented `\documentclass` command in the file which is why the driver must come first.

We also use the hyperref package to allow point and click linking within the document. There are some problems with the index however.

```
\documentclass{ltxdoc}
\usepackage{hyperref}
```

We do want an index, using line numbers

```
% Uncomment these lines to make an index and a change log in the
% documentation.
\AtBeginDocument{\CodelineIndex\EnableCrossrefs}
\AtBeginDocument{\RecordChanges}
%\OnlyDescription % Uncomment this to suppress description of files.
```

The following command retrieves the date and version information from the file.

```
\GetFileInfo{ubcthesis.drv}
```

Some commonly used abbreviations

```
\newcommand*{\Lopt}[1]{\textsf {#1}}
\newcommand*{\file}[1]{\texttt {#1}}
\newcommand*{\Lcount}[1]{\textsl {\small#1}}
\newcommand*{\pstyle}[1]{\textsl {#1}}
\newcommand*{\prog}[1]{\textsc {#1}}
\newcommand{\exclude}[1]{#1}
```

We also want the full details.

```
\begin{document}
\DocInput{ubcthesis.dtx}
```

12 End of Document

```
\end{document}
```

Finally, we close off the driver file so that nothing else is put into the documentation driver.

```
⟨/driver⟩
```

File II

Sample Thesis

This section presents the code for the sample thesis with comments. It is recommended that you first obtain the sample thesis files and compile them as described in Section 4.2.3. This way you can try the various options to see how they work.

Here is the comment that tells DOCSTRIP to put the following code into `sample.tex`.

```
⟨*sampletex⟩
```

13 Identification

This section identifies the version of the file. It also indicates which version of LaTeX (LaTeX 2$_\varepsilon$) is required and makes sure that an appropriate message is displayed when another TeX format is used.

```
%% This Sample thesis requires \LaTeX2e
\NeedsTeXFormat{LaTeX2e}[1995/12/01]
```

Now we announce the file or class name and its version:

```
\ProvidesFile{sample.tex}[2002/12/15 v1.19 ^^J
 University of British Columbia Sample Thesis]
```

14 Document Structure

This section describes the structure that your LaTeX document must have. Various sections of the sample code will be presented to illustrate this structure though the sample file `sample.tex` does not contain all of the options and features.

The first section of a LaTeX document contains information about the structure of the document. This is called the document preamble.

Usually the first command is the `\documentclass` command which specifies the class to use and the options to the class

```

\documentclass[msc,10pt,noupper,appendixpart,oneside]{ubcthesis}
```

```
%% The ubcthesis class uses the standard thesis class so all of the
%% thesis options are available (Defaults are enclosed in []) for example:
%% ...
%% [noappendixpage]/appendixpage - Puts a page separator between the
%%                                 appendices.  Has no effect if the
%%                                 option "appendixpart" is specified.
%%
%% Known bugs:
%% - Even if [upper] is used, the "Appendices" part label is in normal
%% case.
%%
%% To compile issue the following commands:
%% latex sample
%% bibtex sample
%% latex sample
%% latex sample
%% latex sample
%%
%% To view use xdvi (on unix systems):
%% xdvi sample.dvi
%%
%% To make a postscript file, use dvips:
%% dvips -o sample.ps sample.dvi
%%
%% To view the postscript file, use ghostview or gv (on unix systems):
%% gv sample.ps
%%
%%************************************************
%% Optional packages.
```

```
%%
%% The use of these packages is optional: they are standard now and
%% should be installed on your system, but if they are not, you might
%% have to comment out the appropriate lines to get this file to
%% compile.
%%
%%******** natbib ********************************
%% This is a very nice package for bibliographies.  It includes options
%% for sorting and compressing bibliographic entries.
\usepackage[numbers,sort&compress]{natbib}

%%******** hyperref *****************************
%% This adds hyperlinks to your document: with the right viewers (later
%% versions of xdvi, acrobat with pdftex, latex2html etc.) this will
%% make your equation, figure, citation references etc. hyperlinks so
%% that you can click on them.  Also, your table of contents will be
%% able to take you to the appropriate sections.  In the viewers that
%% support this, the links often appear with an underscore.  This
%% underscore will not appear in printed versions.
\usepackage{hyperref}

%% If you would like to compile this sample thesis without the
%% hyperref package, then you will need to comment out the previous
%% \usepackage command and uncomment the following command which will
%% put the URL's in a typewriter font but not link them.
%%\newcommand\href[2]{\texttt{#2}}

%%******** graphics and graphicx ******************************
%% This allows you to include encapsulated postscript files.  If you
%% don't have this, comment the \includegraphics{} line following the
%% comment "%graphics" later in this file.
\usepackage{graphicx}

%%******** lscape ******************************
%% This allows you to include landscape layout pages by using the
%% |landscape| environment. Note that this output might only be valid
%% after converting to a postscript or pdf file.
\usepackage{lscape}

%%******** psfrag ******************************
%% This allows you to replace text in postscript pictures with formated
%% latex text.  This allows you to use math in graph labels
%% etc. Uncomment the psfrag lines following the "%psfrag" comment
%% later in this file if you don't have this package.  The replacements
%% will only be visible in the final postscript file: they will be
%% listed in the .dvi file but not performed.
\usepackage{psfrag}

%% These commands are optional.  The defaults are shown.
\institution{The University Of British Columbia}
\institutionaddress{Vancouver, Canada}
\department{Department of Physics and Astronomy}
\numberofsignatures{4}          % Signature lines on title page

```

```
%% You can issue as many of these as you have...
\previousdegree{B.Sc., The University of British Columbia, 1989}
\previousdegree{M.Sc., The University of Toronto, 1992}

%% You can override the option setting here.
%% \degreetitle{Jack of All Trades}

%% These commands are required.
\title{A Sample Thesis}
\subtitle{With a Subtitle}
\author{Michael McNeil Forbes}
\copyrightyear{2000}
\submitdate{\today}
```

14.1 Chapter and section counter formats

For any counter *CTR*, `\theCTR` is a macro that defines the printed version of counter *CTR*. It is defined in terms of the following macros:

`\arabic{`*COUNTER*`}` prints the value of *COUNTER* as an Arabic numeral.

`\roman{`*COUNTER*`}` prints the value of *COUNTER* as a lowercase Roman numeral.

`\Roman{`*COUNTER*`}` prints the value of *COUNTER* as an uppercase Roman numeral.

`\alph{`*COUNTER*`}` prints the value of *COUNTER* as a lowercase letter: $1 =$ a, $2 =$ b, etc.

`\Alph{`*COUNTER*`}` prints the value of *COUNTER* as an uppercase letter: $1 =$ A, $2 =$ B, etc.

This section of the sample class redefines these (actually, the redefinitions match the defaults so this would be pointless in the actual thesis, but is here for demonstration purposes.)

```
%% One might want to override the format of the section and chapter
%% numbers.  This shows you how to do it.  Note that
\renewcommand\thepart          {\Roman{part}}
\renewcommand\thechapter       {\arabic{chapter}}
```

The section and lower commands also display the numbers of higher sections too and a punctuation mark. These show you how to change these. (Again, the formats actually given here are the defaults.)

```
\renewcommand\thesection       {\thechapter.\arabic{section}}
\renewcommand\thesubsection    {\thesection.\arabic{subsection}}
\renewcommand\thesubsubsection{\thesubsection.\arabic{subsubsection}}
\renewcommand\theparagraph     {\thesubsubsection.\arabic{paragraph}}
\renewcommand\thesubparagraph {\theparagraph.\arabic{subparagraph}}

% Two related counters control the level of sections that are numbered
% and the level of sections included in the table of contents:
\setcounter{tocdepth}{2}
\setcounter{secnumdepth}{2}

%% Here is the start of the document.
\begin{document}

%% This starts numbering in Roman numerals as required for the thesis
```

```
%% style.
\frontmatter

%% The order of the following components is preserved.  The order
%% listed here is the order currently required by the library.
\maketitle
\authorizationform
\begin{abstract}
  The \texttt{ubcthesis.cls} \LaTeX\ class file and accompanying
  documents, such as this sample thesis, are distributed in the hope
  that it will be useful but without any warranty (without even the
  implied warranty of fitness for a particular purpose).  For a
  description of this file's purpose, and instructions on its use, see
  below.

  These files are distributed under the GPL which should be included
  here in the future.  Please let the author know of any changes or
  improvements that should be made.

  Michael Forbes.
  mforbes@physics.ubc.ca
\end{abstract}

\tableofcontents
\listoftables
\listoffigures
%% Any other lists should come here, i.e.
%% Abbreviation schemes, definitions, lists of formulae, list of
%% schemes, prior publications.  Only include a list of prior
%% publications if required by your department.

\preface
These papers have been published earlier\ldots.

\acknowledgements
Thank you mother here.

%% Force a new page.
\newpage

%% Any other unusual sections should come here between the
%% acknowledgements and the main body.

%% Suppress the running headers for this page only.
\thispagestyle{plain}
\chapter*{Disclaimer} % Unnumbered
The \texttt{ubcthesis} \LaTeX\ class and the accompanying sample files
are \emph{unofficial} and are not supported by The University of
British Columbia.  While I have attempted to make the style file and
sample files conform to all of the requirements set forth by the
Special Collections department of the library, you should always
consult one of the Special Collections staff for assistance with problems
\emph{before} starting final draft.  You should be able to find the
thesis requirements at one of the following sites:
```

```
\begin{table}[h]
  \begin{center}
    \begin{tabular}{|l|}
      \hline
      \href{http://www.library.ubc.ca/}
      {\texttt{http://www.library.ubc.ca/}}\\
      \href{http://www.library.ubc.ca/spcoll/}
      {\texttt{http://www.library.ubc.ca/spcoll/}}\\
      \href{http://www.library.ubc.ca/spcoll/theses.html}
      {\texttt{http://www.library.ubc.ca/spcoll/theses.html}}\\
      \href{http://www.library.ubc.ca/spcoll/thesesin.html}
      {\texttt{http://www.library.ubc.ca/spcoll/thesesin.html}}\\
      \href{http://www.grad.ubc.ca/}
      {\texttt{http://www.grad.ubc.ca/}}\\
      \href{http://www.grad.ubc.ca/currstudents/}
      {\texttt{http://www.grad.ubc.ca/currstudents/}}\\
      \href{http://www.grad.ubc.ca/currstudents/records/thesis.htm}
      {\texttt{http://www.grad.ubc.ca/currstudents/records/thesis.htm}}\\
      \hline
    \end{tabular}
  \end{center}
  \caption{\label{tab:ubcurls}
    Where to find information regarding thesis preparation at
    \protect\href{http://www.ubc.ca/}{UBC}.}
\end{table}

%% Force a new page.
\newpage

%% Suppress the running headers for this page only.
\thispagestyle{plain}

%% The ___toc commands are new: they accept two arguments.  The first is
%% displayed as the heading, the second appears in the table of
%% contents.  This is only provided for unnumbered sections
%% etc. presently. A similar effect without a listing in the toc would
%% be achieved by the standard command:
%% \chapter*{A Japanese Introduction}
\chaptertoc{A Japanese Introduction}{Poem} % Unnumbered

%% Here is a quote:
\begin{quote}
  % It is centered
  \begin{center}
    This is a small poem,\\
    a little poem, a Haiku,\\
    to show you how to.\\
    ---Michael Forbes.
  \end{center}
\end{quote}
This small poem shows several features:
\begin{itemize}
\item The \verb|\newpage| command has been used to force a page break.
```

```latex
\item The pagestyle has been set to suppress the headers using the
  command \verb|\thispagestyle{plain}|.  Note that using
  \verb|\pagestyle{plain}| would have affected all of the subsequent
  pages.
\item The new \verb|\chaptertoc{}|
  command has been used to generate a title and to list this
  ``chapter'' in the table of contents as ``Poem''.  If one did not
  desire to have an entry in the table of contents, then one would
  just use the starred command \verb|\chapter*{}|.
\item All of this has been done \emph{before} the \verb|\mainmatter|
  command has been issued to delay normal Arabic numbering.  Thus,
  this poem will be numbered with lowercase Roman numerals as part of
  the front matter.
\end{itemize}

%% Now regular page numbering begins.
\mainmatter

%% Parts are the largest units
\part{Thesis}

%% Chapters are the next main unit.
\chapter{This is a Chapter}

%% Sections are a sub-unit
\section{A Section}
Here is a section with some text.  Equations look like this $y=x$.

This is an example of a second paragraph in a section so you can
see how much it is indented by.

%% Subsections follow
\subsection{This is a Subsection}
Here is an example of a citation: \cite{Wandelt:2000ad}.  The actual
form of the citation is governed by the bibliographystyle.  These
citations are maintained in a BIBTeX file \texttt{sample.bib}.  You
could type these directly into the file.  For an example of the format
to use look at the file \texttt{sample.bbl} after you compile this
file.

This is an example of a second paragraph in a subsection so you can
see how much it is indented by.

\subsubsection{This is a Subsubsection}
Here are some more citations \cite{LL:1977,Peccei:1989,Turner:1999}.
If you use the \texttt{natbib} package with the \verb+sort&compress+
option, then the following citation will look the same as the first
citation in this section: \cite{Turner:1999,Peccei:1989,LL:1977}.

This is an example of a second paragraph in a subsubsection so you can
see how much it is indented by.

\paragraph{This is a Paragraph}
Paragraphs and subparagraphs are the smallest units of text.  There is
```

```
no subsubsubsection etc.

\subparagraph{This is a Subparagraph}
This is the last level of organisation.  If you need more than this,
you should consider reorganising your work\dots

\begin{equation}
  \mathrm{f}(x)=\int_{-\infty}^{\int_{-\infty}^x
    e^{-\frac{y^2}{2}}\mathrm{d}{y}}e^{-z^2}\mathrm{d}z
\end{equation}

In order to show you how a separate page would look like (i.e. without
a chapter heading) I must type some more text.  Thus I will babble a
bit and keep babbling for at least one more page\ldots  What you
should notice is that the chapter titles appear substantially lower
than the continuing text. Babble babble
babble babble babble babble babble babble babble babble babble babble
babble babble babble babble babble babble babble babble babble babble
babble babble babble babble babble babble babble babble babble babble
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Babble babble babble babble babble babble babble babble babble babble
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babble babble babble babble babble babble babble babble babble babble
babble babble babble babble babble babble babble babble babble babble
babble babble babble babble.

\begin{table}[t]                %optional [t, b or h];
  \begin{tabular}{|r||r@{.}l|}
    \hline
    Phoenix & \$960&35\\
    \hline
    Calgary & \$250&00\\
    \hline
  \end{tabular}
  \caption{
    \label{tab:Table1}
    Here is the caption for this wonderful table.Text of Caption}
\end{table}

\chapter[Another Chapter\ldots]{Another Chapter with a Very Long
  Chapter-name that will Probably Cause Problems}
This chapter name is very long and does not display properly in the
running headers or in the table of contents.  To deal with this, we
provide a shorter version of the title as the optional argument to the
\verb|\chapter[]{}| command.
```

```
\section{Another Section}
Another bunch of text to demonstrate what this file does.
You might want a list for example:
\begin{itemize}
\item An item in a list.
\item Another item in a list.
\end{itemize}

\section*{An Unnumbered Section That is Not Included in the Table of Contents}
Here is an example of a figure environment:
\begin{figure}[ht]
  \begin{center}
%%psfrag: comment the following line if not using the psfrag package
    \psfrag{pie makes me happy!}{$\pi$ makes me happy!}
%%includegraphics: comment the following if not using the graphicx package
    \includegraphics[width=0.4\textwidth]{fig.eps}
    \caption{This is a figure of a happy face with a \texttt{psfrag}
      replacement.  The original figure (drawn in xfig and exported to
      a .eps file) has the text ‘‘pie makes me happy!’’.  The
      \texttt{psfrag} package replaces this with ‘‘$\pi$ makes me
      happy!’’.\label{fig:happy}}
  \end{center}
\end{figure}
Figures can make a document more enjoyable as demonstrated by
Figure~\ref{fig:happy}.

\subsection*{An Unnumbered Subsection}
Note that if you use subsections or further divisions under an
unnumbered section, then you should make them unnumbered as well
otherwise you will end up with zeros in the section numbering.

\begin{landscape}
\chapter{Landscape Mode}
The landscape mode allows you to rotate a page about 90 degrees.  Note
that this might only work after you convert the \texttt{dvi} file to a
postscript (\texttt{ps}) or \texttt{pdf} file using \texttt{dvips} or
\texttt{dvipdf} etc.
\end{landscape}

%% This file is setup to use a bibtex file sample.bib and uses the
%% plain style.  Note, the bibliography could come after the appendices.
\bibliographystyle{plain}
\bibliography{sample}

%% Use this to reset the appendix counter.
\appendix
\chapter{First Appendix}
Here you can have your appendices. Note that the appendix bug will
get you here if you use the option \texttt{upper}.  Use the modified
thesis.cls file to work around this.

%% Indices come here.
```

15 End of Document

```
\end{document}
```

Finally, we close off the file so that nothing else is put into the sample thesis.

```
⟨/sampletex⟩
```

File III
Sample Bibliographic Database (BIBTeX)

This section presents the code for the bibliographic database for the sample thesis with comments. It is recommended that you first obtain the sample thesis files and compile them as described in Section 4.2.3. This way you can try the various options to see how they work.

Here is the comment that tells DOCSTRIP to put the following code into `sample.bib`.

```
⟨*samplebib⟩
```

16 Identification

This section identifies the version of the file. Formally this should be a comment, but as it appears prior to any entry, bibtex will treat it as a comment (beware though, the character may not appear outside of an entry.)

```
\ProvidesFile{sample.bib}[2002/12/15 v1.19 ^^J
University of British Columbia Sample Thesis]
```

17 Document Structure

```
%% These are just some examples of articles and books.  Some of the fields
%% are not needed, for example the abstract and SLACcitation fields.  There
%% are many other types of documents.  The entry CL:2000 poses a problem
%% in the URL field.  I am not sure how to get around this right now.

@Article{Wandelt:2000ad,
  author       = "Benjamin D. Wandelt and Romeel Dave and Glennys R.
                  Farrar and Patrick C. McGuire and David N. Spergel and
                  Paul J. Steinhardt",
  title        = "Self-interacting dark matter",
  year         = "2000",
  eprint       = "astro-ph/0006344",
  SLACcitation = "%%CITATION = ASTRO-PH 0006344;%%",
  abstract     = "Spergel and Steinhardt have recently proposed the
                  concept of dark matter with strong self-interactions as
                  a means to address numerous discrepancies between
                  observations of dark matter halos on subgalactic scales
                  and the predictions of the standard collisionless dark
```

```
                  matter picture. We review the motivations for this
                  scenario and discuss some recent, successful numerical
                  tests. We also discuss the possibility that the dark
                  matter interacts strongly with ordinary baryonic
                  matter, as well as with itself. We present a new
                  analysis of the experimental constraints and
                  re-evaluate the allowed range of cross-section and
                  mass.",
}

@Book{LL:1977,
  author        = "L. D. Landau and E. M. Lifshitz",
  title         = "Quantum Mechanics: Non-relativistic theory",
  publisher     = "Pergamon Press",
  year          = "1989, c1977",
  volume        = "3",
  series        = "Course of Theoretical Physics",
  address       = "Oxford; New York",
  edition       = "Third",
}


@InCollection{Peccei:1989,
  author        = "R. D. Peccei",
  title         = "Special Topics: The Strong {CP} Problem",
  booktitle     = "CP violation",
  publisher     = "World Scientific",
  year          = "1989",
  editor        = "C. Jarlskog",
  address       = "Singapore",
  month         = jan,
}

@InProceedings{CL:2000,
  author        = "S. A. {Colgate} and H. {Li}",
  title         = "The Magnetic Fields of the Universe and Their Origin",
  booktitle     = "10 pages, 1 figure (figures.png), invited talk at IAU
                  195 Preprint no. LAUR 00-180.",
  year          = "2000",
  month         = jan,
  pages         = "1418",
  URL           = "{http://adsabs.harvard.edu/cgi-bin/nph-bib_query?bibcode=\
2000astro.ph..1418C&db_key=PRE}",
  adsnote       = "Provided by the NASA Astrophysics Data System",
  eprint        = "astro-ph/0001418",
  abstract      = "Recent rotation measure observations of a dozen or so
                  galaxy clusters have revealed a surprisingly large
                  amount of magnetic fields, whose estimated energy and
                  flux are, on average, {$\sim 10^{58}$} ergs and {$\sim
                  10^{41}$ G cm$^2$}, respectively. These quantities are
                  so much larger than any coherent sums of individual
                  galaxies within the cluster that an efficient galactic
                  dynamo is required. We associate these fields with
                  single AGNs within the cluster and therefore with all
```

```
                 galaxies during their AGN phase. Only the central,
                 massive black hole (BH) has the necessary binding
                 energy, {$\sim 10^{61}$} ergs. Only the accretion disk
                 during the {BH} formation has the winding number,
                 {$\sim 10^{11}$} turns, necessary to make the gain and
                 magnetic flux. We present a model of the BH accretion
                 disk dynamo that might create these magnetic fields,
                 where the helicity of the {$\alpha - \Omega$} dynamo is
                 driven by star-disk collisions. The back reaction of
                 the saturated dynamo forms a force-free field helix
                 that carries the energy and flux of the dynamo and
                 redistributes them within the clusters.",
}

@Misc{Turner:1999,
  author       = "M. S. Turner",
  title        = "Dark Matter, Dark Energy and Fundamental Physics",
  howpublished = "astro-ph/9912211",
  year         = "1999",
  month        = dec,
  abstract     = "More than sixty years ago Zwicky made the case that
                 the great clusters of galaxies are held together by the
                 gravitational force of unseen (dark) matter. Today, the
                 case is stronger and more precise: Dark, nonbaryonic
                 matter accounts for {$30\% \pm 7\%$} of the critical mass
                 density, with baryons (most of which are dark)
                 contributing only {$4.5\% \pm 0.5\%$} of the critical
                 density. The large-scale structure that exists in the
                 Universe indicates that the bulk of the nonbaryonic
                 dark matter must be cold (slowly moving particles). The
                 SuperKamiokande detection of neutrino oscillations
                 shows that particle dark matter exists, crossing an
                 important threshold. Over the past few years a case has
                 developed for a dark-energy problem. This dark
                 component contributes about {$80\% \pm 20\%$} of the critical
                 density and is characterized by very negative pressure
                 {$(p_X < -0.6 \rho_X)$}. Consistent with this picture of
                 dark energy and dark matter are measurements of {CMB}
                 anisotropy that indicate that total contribution of
                 matter and energy is within {$10\%$} of the critical
                 density. Fundamental physics beyond the standard model
                 is implicated in both the dark matter and dark energy
                 puzzles: new fundamental particles (e.g., axion or
                 neutralino) and new forms of relativistic energy (e.g.,
                 vacuum energy or a light scalar field). A flood of
                 observations will shed light on the dark side of the
                 Universe over the next two decades; as it does it will
                 advance our understanding of the Universe and the laws
                 of physics that govern it.",
}

@Book{Vilenkin:1994,
  author =       {Alexander Vilenkin and E. P. S. Shellard},
  title =        {Cosmic Stringas and Other Topological Defects},
```

```
  publisher =    {Cambridge University Press},
  year =         1994,
  address =      {Cambridge}
}

⟨/samplebib⟩
```

File IV
The `ubcthesis` Document Class

Here is the comment that tells DOCSTRIP to put the following code into `sample.tex`.

```
⟨*ubcthesis⟩
```

18 Identification

This section identifies the version of the file. It also indicates which version of LaTeX (LaTeX 2_ε) is required and makes sure that an appropriate message is displayed when another TeX format is used.

```
\NeedsTeXFormat{LaTeX2e}[1995/12/01]
```

Now we announce the file or class name and its version:

```
\ProvidesClass{ubcthesis}[2002/12/15 v1.19 ^^J
 University of British Columbia Thesis Class]
```

19 Initial Code

In this part we define a few commands that are used later on.

`\@ptsize` This control sequence is used to store the second digit of the pointsize we are typesetting in. So, normally, it's value is one of 0, 1 or 2.

```
\newcommand\@ptsize{}
```

`\if@restonecol` When the document has to printed in two columns, we sometimes have to temporarily switch to one column. This switch is used to remember to switch back.

```
\newif\if@restonecol
```

`\@chaptertocdots` This turns on chapter leaders in the table of contents.

```
\newif\if@chaptertocdots \@chaptertocdotstrue
```

`\SetTime` `\hours` `\minutes` `\now` These are some macros that set the time for use in the headers in draft mode.

```
\newcount\hours
\newcount\minutes
\def\SetTime{\hours=\time
        \global\divide\hours by 60
        \minutes=\hours
        \multiply\minutes by 60
        \advance\minutes by-\time
```

```
       \global\multiply\minutes by-1 }
\def\now{\number\hours:\ifnum\minutes<10 0\fi\number\minutes}
```

`\@toupper` `\@toctoupper`

Converts the argument to uppercase if the upper or tocupper options are specified. invoked.

```
\newcommand\@toupper[1]{\if@upper\MakeUppercase{#1}\else{#1}\fi}
\newcommand\@toctoupper[1]{\if@tocupper\MakeUppercase{#1}\else{#1}\fi}
```

`\@startonecolumn` `\@endonecolumn`

These ensure one-column mode and restore for things like the toc, authorization form, titlepage etc. First we must define some temporary lengths to save the old lengths.

```
\newlength\oldtextwidth
\newlength\oldlinewidth
\newlength\oldparindent
\newlength\oldmarginparsep
\newlength\oldmarginparwidth
\newlength\oldoddsidemargin
\newlength\oldevensidemargin
```

Now we define the macro body.

```
\providecommand*{\@startonecolumn}{
 \if@twocolumn
   \@restonecoltrue

   \global\setlength\oldtextwidth{\textwidth}
   \global\setlength\oldlinewidth{\linewidth}
```

First, we calculate the maximum `\textwidth`, which we will allow on the selected paper and store it in `\@tempdima`. Then we store the length of a line with approximately 60–70 characters in `\@tempdimb`. The values given are more or less suitable when Computer Modern fonts are used.

```
   \setlength\@tempdima{\paperwidth}
   \addtolength\@tempdima{-2in}
   \ifcase\@ptsize\relax
     \setlength\@tempdimb{345\p@}
   \or
     \setlength\@tempdimb{360\p@}
   \or
     \setlength\@tempdimb{390\p@}
   \fi
```

In one column mode the text should not be wider than the minimum of the paperwidth (minus 2 inches for the margins) and the maximum length of a line as defined by the number of characters.

```
   \ifdim\@tempdima>\@tempdimb\relax
     \global\setlength\textwidth{\@tempdimb}
   \else
     \global\setlength\textwidth{\@tempdima}
   \fi
```

Here we modify the width of the text a little to be a whole number of points.

```
   \global\@settopoint\textwidth
   \global\setlength\linewidth{\textwidth}
```

The horizontal space between the main text and marginal notes is determined by `\marginparsep`, the minimum vertical separation between two marginal notes is controlled by `\marginparpush`.

```
  \global\setlength\oldmarginparsep{\marginparsep}
  \global\setlength\marginparsep{7\p@}

  \global\setlength\oldparindent{\parindent}
  \ifcase\@ptsize\relax
    \global\setlength\parindent{15\p@}
  \or
    \global\setlength\parindent{17\p@}
  \or
    \global\setlength\parindent{1.5em}
  \fi
```

For one-sided printing we center the text on the page, by calculating the difference between `\textwidth` and `\paperwidth`. Half of that difference is than used for the margin (thus `\oddsidemargin` is `1in` less).

```
  \global\setlength\oldmarginparwidth{\marginparwidth}
  \global\setlength\oldoddsidemargin{\oddsidemargin}

  \if@twoside
    \setlength\@tempdima        {\paperwidth}
    \addtolength\@tempdima      {-\textwidth}
    \global\setlength\oddsidemargin {.4\@tempdima}
    \addtolength\oddsidemargin  {-1in}
```

The width of the margin for text is set to the remainder of the width except for a 'real margin' of white space of width 0.4in. A check should perhaps be built in to ensure that the (text) margin width does not get too small!

```
    \global\setlength\marginparwidth   {.6\@tempdima}
    \global\addtolength\marginparwidth {-\marginparsep}
    \global\addtolength\marginparwidth {-0.4in}
```

For one-sided printing we center the text on the page, by calculating the difference between `\textwidth` and `\paperwidth`. Half of that difference is than used for the margin (thus `\oddsidemargin` is `1in` less).

```
  \else
    \setlength\@tempdima        {\paperwidth}
    \addtolength\@tempdima      {-\textwidth}
    \global\setlength\oddsidemargin    {.5\@tempdima}
    \global\addtolength\oddsidemargin  {-1in}
    \global\setlength\marginparwidth   {.5\@tempdima}
    \global\addtolength\marginparwidth {-\marginparsep}
    \global\addtolength\marginparwidth {-0.4in}
    \global\addtolength\marginparwidth {-.4in}
  \fi
```

With the above algorithm the `\marginparwidth` can come out quite large which we may not want.

```
  \ifdim \marginparwidth >2in
    \global\setlength\marginparwidth{2in}
  \fi
```

Having done these calculations we make them pt values.

```
    \global\@settopoint\oddsidemargin
    \global\@settopoint\marginparwidth
```

The `\evensidemargin` can now be computed from the values set above.

```
    \global\setlength\oldevensidemargin{\evensidemargin}

    \global\setlength\evensidemargin  {\paperwidth}
    \global\addtolength\evensidemargin{-2in}
    \global\addtolength\evensidemargin{-\textwidth}
    \global\addtolength\evensidemargin{-\oddsidemargin}

```

Setting `\evensidemargin` to a full point value may produce a small error. However it will lie within the error range a doublesided printer of today's technology can accurately print.

```
    \global\@settopoint\evensidemargin
```

Now we change the number of columns because this command uses the lengths to format stuff.

```
    \onecolumn
  \else
    \@restonecolfalse
  \fi
}
\providecommand*{\@endonecolumn}{
  \if@restonecol
    \global\setlength\textwidth{\oldtextwidth}
    \global\setlength\linewidth{\oldlinewidth}
    \global\setlength\parindent{\oldparindent}
    \global\setlength\marginparsep{\oldmarginparsep}
    \global\setlength\marginparwidth{\oldmarginparwidth}
    \global\setlength\oddsidemargin{\oldoddsidemargin}
    \global\setlength\evensidemargin{\oldevensidemargin}
    \twocolumn
  \fi}
```

`\if@openright` A switch to indicate if chapters must start on a right-hand page. The default for the report class is no; for the book class it's yes.

```
\newif\if@openright
```

`\if@mainmatter` The switch `\if@mainmatter`, only available in the document class book, indicates whether we are processing the main material in the book.

```
\newif\if@mainmatter \@mainmattertrue
```

20 Document Markup Functions

These are defined here because some of the commands are used by the options.

20.1 The title

\title \author \date

These three macros are provided by `latex.dtx` to provide information about the title, author(s) and date of the document. The information is stored away in internal control sequences. It is the task of the `\maketitle` command to use the information provided. The definitions of these macros are shown here for information.

```
% \newcommand*{\title}[1]{\gdef\@title{#1}}
% \newcommand*{\author}[1]{\gdef\@author{#1}}
% \newcommand*{\date}[1]{\gdef\@date{#1}}
```

The `\date` macro gets today's date by default.

```
% \date{\today}
```

\subtitle

This macro also has an associated boolean which tells the titlepage whether or not it should attempt to display a subtitle.

```
\newif\if@subtitle \@subtitlefalse
\newcommand*{\subtitle}[1]{\@subtitletrue \gdef\@subtitle{#1}}
```

\institution \institutionaddress \degreetitle \department \faculty

These commands are added for theses. They are used on the title page.

```
\newcommand*{\institution}[1]{\gdef\@institution{#1}}
\def\@institution{\@latex@warning@no@line{No \noexpand\institution\ given}}
\newcommand*{\institutionaddress}[1]{\gdef\@institutionaddress{#1}}
\def\@institutionaddress{\@latex@warning@no@line{No
    \noexpand\institutionaddress\ given}}
\newcommand*{\degreetitle}[1]{\gdef\@degreetitle{#1}}
\def\@degreetitle{\@latex@warning@no@line{No \noexpand\degreetitle\ given}}
\newcommand*{\department}[1]{\gdef\@department{#1}}
\def\@department{\@latex@warning@no@line{No \noexpand\department\ given}}
\newcommand*{\faculty}[1]{\gdef\@faculty{#1}}
\def\@faculty{\@latex@warning@no@line{No \noexpand\faculty\ given}}
```

Some of these get default values here:

```
\institution{The University of British Columbia}
\institutionaddress{Vancouver, Canada}
\department{Department of Physics and Astronomy}
\faculty{The Faculty of Graduate Studies}
```

\numberofsignatures

This is the number of signature lines to put on the cover.

```
\newcommand*{\numberofsignatures}[1]{\gdef\@numberofsignatures{#1}}
\numberofsignatures{4}
```

\@copyrightyear \@submitdate

These are dates. By default, these are set to the date of compilation.

```
\newcommand*{\copyrightyear}[1]{\gdef\@copyrightyear{#1}}
\newcommand*{\submitdate}[1]{\gdef\@submitdate{#1}}
\copyrightyear{\number\year}
\submitdate{\today}
```

\previousdegree

This may be issued more than once. Each degree is added to the buffer. The buffer starts empty.

```
\newcommand\@previousdegrees{}
```

To add a new line we must use the `\expandafter` TeX command. This causes the commands to be expanded pairwise—hence why we need several of them—from right to left rather than from left to right. The last `\expandafter` acts on the following command. Note that we add the newline at the end to prevent too much space from occuring at between the author and the previous degrees in the case of a full titlepage.

```
\newcommand*\previousdegree[1]{
  \expandafter\gdef\expandafter\@previousdegrees\expandafter
  {\@previousdegrees{#1}\\}}
```

20.2 Fonts

These options provide access to the various fonts for chapter titles etc. First we must define the font variables. The two fonts `\titlepagefont` and `\titlefont` are used as defaults, though options may changes these.

`\titlepagefont` `\titlefont` `\subtitlefont` `\authorfont` `\degreetitlefont` `\facultyfont` `\institutionfont`

These fonts are used on the title page.

```
\newcommand\titlepagefont{\normalsize}
\newcommand\titlefont{}
\newcommand\subtitlefont{\titlefont}
\newcommand\authorfont{\titlepagefont}
\newcommand\degreetitlefont{\titlepagefont}
\newcommand\facultyfont{\titlepagefont}
\newcommand\institutionfont{\titlepagefont}
```

```
\newcommand\abstractfont{}
\newcommand\partfont{}
\newcommand\partnamefont{}
\newcommand\chapterfont{}
\newcommand\chaptertitlefont{}
\newcommand\chapterauthorfont{}
\newcommand\sectionfont{}
\newcommand\subsectionfont{}
\newcommand\subsubsectionfont{}
\newcommand\paragraphfont{}
\newcommand\subparagraphfont{}
\newcommand\translatorfont{}
\newcommand\theoremheaderfont{}
\newcommand\theorembodyfont{}
\newcommand\itemfont{}
\newcommand\examplefont{}
\newcommand\headingstextfont{}
\newcommand\pagenumberfont{}
\newcommand\captionheaderfont{}
\newcommand\captionbodyfont{}
\newcommand\figurefont{}
\newcommand\tablefont{}
\newcommand\indexsize{}
\newcommand\bibsize{}
```

20.3 Spacing

These options are the various spacings used in Section headings etc.

`\partbetweenskip`

This length allows for one to adjust the space between the part heading and the part title

`\chapterbeforeskip` `\chapterbetweenskip` `\chapterafterskip`

These lengths allow for one to adjust the space before the chapter headings, between the chapter heading and chapter titles and after the chapter titles.

`\sectionindent` `\sectionbeforeskip` `\sectionafterskip` `\subsectionindent` `\subsectionbeforeskip` `\subsectionafterskip` `\subsubsectionindent` `\subsubsectionbeforeskip` `\subsubsectionafterskip` `\paragraphindent` `\paragraphbeforeskip` `\paragraphafterskip` `\subparagraphindent` `\subparagraphbeforeskip` `\subparagraphafterskip`

```
\newlength{\partbetweenskip}
\newlength{\chapterbeforeskip}
\newlength{\chapterbetweenskip}
\newlength{\chapterafterskip}
\newlength{\sectionindent}
\newlength{\sectionbeforeskip}
\newlength{\sectionafterskip}
\newlength{\subsectionindent}
\newlength{\subsectionbeforeskip}
\newlength{\subsectionafterskip}
\newlength{\subsubsectionindent}
\newlength{\subsubsectionbeforeskip}
\newlength{\subsubsectionafterskip}
\newlength{\paragraphindent}
\newlength{\paragraphbeforeskip}
\newlength{\paragraphafterskip}
\newlength{\subparagraphindent}
\newlength{\subparagraphbeforeskip}
\newlength{\subparagraphafterskip}
```

`\lofindent` `\lotindent`

These lengths specify how much to indent the list of figures and list of tables.

```
\newcommand{\lofindent}{1.5em}
\newcommand{\lotindent}{1.5em}
```

`\loflabelwidth` `\lotlabelwidth`

These lengths specify how much space to leave for figure an table labels in the list of figures an list of tables.

```
\newcommand{\loflabelwidth}{2.3em}
\newcommand{\lotlabelwidth}{2.3em}
```

21 Declaration of Options

21.1 Setting Paper Sizes

`a4paper` `a5paper` `b5paper` `letterpaper` `legalpaper` `executivepaper`

The variables `\paperwidth` and `\paperheight` should reflect the physical paper size after trimming. For desk printer output this is usually the real paper size since there is no post-processing. Classes for real book production will probably add other paper sizes and additionally the production of crop marks for trimming.

```
\DeclareOption{a4paper}
   {\setlength\paperheight {297mm}%
    \setlength\paperwidth  {210mm}}
\DeclareOption{a5paper}
   {\setlength\paperheight {210mm}%
    \setlength\paperwidth  {148mm}}
```

```
\DeclareOption{b5paper}
   {\setlength\paperheight {250mm}%
    \setlength\paperwidth  {176mm}}
\DeclareOption{letterpaper}
   {\setlength\paperheight {11in}%
    \setlength\paperwidth  {8.5in}}
\DeclareOption{legalpaper}
   {\setlength\paperheight {14in}%
    \setlength\paperwidth  {8.5in}}
\DeclareOption{executivepaper}
   {\setlength\paperheight {10.5in}%
    \setlength\paperwidth  {7.25in}}
```

`landscape` The option landscape switches the values of `\paperheight` and `\paperwidth`, assuming the dimensions were given for portrait paper.

```
\DeclareOption{landscape}
   {\setlength\@tempdima   {\paperheight}%
    \setlength\paperheight {\paperwidth}%
    \setlength\paperwidth  {\@tempdima}}
```

21.2 Choosing the type size

`10pt` `11pt` `12pt` The type size options are handled by defining `\@ptsize` to contain the last digit of the size in question and branching on `\ifcase` statements. This is done for historical reasons to stay compatible with other packages that use the `\@ptsize` variable to select special actions. It makes the declarations of size options less than 10pt difficult, although one can probably use 9 and 8 assuming that a class wont define both 8pt and 18pt options.

```
\DeclareOption{10pt}{\renewcommand\@ptsize{0}}
\DeclareOption{11pt}{\renewcommand\@ptsize{1}}
\DeclareOption{12pt}{\renewcommand\@ptsize{2}}
```

21.3 Two-side or one-side printing

`oneside` `twoside` For two-sided printing we use the switch `\if@twoside`. In addition we have to set the `\if@mparswitch` to get any margin paragraphs into the outside margin.

Note that the user must specify when printing that the printer print double sided: there is no information in the file which indicates this. This option only ensures that the margins will line up properly.

```
\DeclareOption{oneside}{\@twosidefalse \@mparswitchfalse}
\DeclareOption{twoside}{\@twosidetrue  \@mparswitchtrue}
```

21.4 Draft and committee options

`final` `draft` If the user requests draft we show any overfull boxes. We could probably add some more interesting stuff to this option.

```
\newif\if@final \@finaltrue
\DeclareOption{draft}{\setlength\overfullrule{5pt}\@finalfalse \SetTime}
\DeclareOption{final}{\setlength\overfullrule{0pt}\@finaltrue}
```

`committee` Use this option when producing the version to send to your thesis committee if they want the document with 1.5 spacing so there is some room for comments between the lines. You may change the spacing by redefining the `\committeespacing` command.

```
\newif\if@committee \@committeefalse
\DeclareOption{committee}{\@committeetrue}
```

21.5 openright option

`openright` `openany` This option determines whether o not a chapter must start on a right-hand page request one.

```
\DeclareOption{openright}{\@openrighttrue}
\DeclareOption{openany}{\@openrightfalse}
```

21.6 Two-column printing

`onecolumn` `twocolumn` Two-column and one-column printing is again realized via a switch. Remember that you must also tell the printer to print on both sides though!

```
\DeclareOption{onecolumn}{\@twocolumnfalse}
\DeclareOption{twocolumn}{\@twocolumntrue}
```

21.7 Running headers

`runningheaders` `norunningheaders` These display or suppress running headers that contain the current chapter name and number. If they are suppressed, only the pagenumber will be displayed.

```
\newif\if@runningheaders \@runningheaderstrue
\DeclareOption{runningheaders}{\@runningheaderstrue}
\DeclareOption{norunningheaders}{\@runningheadersfalse}
```

`centerheadline` `nocenterheadline` These control the centering of the running headers.

```
\newif\if@centerheadline \@centerheadlinetrue
\DeclareOption{centerheadline}{\@centerheadlinetrue}
\DeclareOption{nocenterheadline}{\@centerheadlinefalse}
```

`headline` `noheadline` These control the display of a horizontal line below the running headers at the top of the page.

```
\newif\if@headline \@headlinetrue
\DeclareOption{headline}{\@headlinetrue}
\DeclareOption{noheadline}{\@headlinefalse}
```

21.8 Equation numbering on the left

The option leqno can be used to get the equation numbers on the left side of the equation. It loads code which is generated automatically from the kernel files when the format is built. If the equation number does get a special formatting then instead of using the kernel file the class would need to provide the code explicitly.

`leqno`

```
\DeclareOption{leqno}{\input{leqno.clo}}
```

21.9 Flush left displays

The option fleqn redefines the displayed math environments in such a way that they come out flush left, with an indentation of `\mathindent` from the prevailing left margin. It loads code which is generated automatically from the kernel files when the format is built.

fleqn

```
\DeclareOption{fleqn}{\input{fleqn.clo}}
```

21.10 Title page

uppertitle/nouppertitle
uppersubtitle/nouppersubtitle
upperauthor/noupperauthor
upperdegreetitle/noupperdegreetitle
upperfaculty/noupperfaculty
upperdepartment/noupperdepartment
upperinstitution/noupperinstitution

These options affect the display of the titlepage.

```
\newif\if@uppertitle \@uppertitlefalse
\DeclareOption{uppertitle}{\@uppertitletrue\@uppersubtitletrue}
\DeclareOption{nouppertitle}{\@uppertitlefalse\@uppersubtitlefalse}
\newif\if@uppersubtitle \@uppersubtitlefalse
\DeclareOption{uppersubtitle}{\@uppersubtitletrue}
\DeclareOption{nouppersubtitle}{\@uppersubtitlefalse}
\newif\if@upperauthor \@upperauthorfalse
\DeclareOption{upperauthor}{\@upperauthortrue}
\DeclareOption{noupperauthor}{\@upperauthorfalse}
\newif\if@upperdegreetitle \@upperdegreetitletrue
\DeclareOption{upperdegreetitle}{\@upperdegreetitletrue}
\DeclareOption{noupperdegreetitle}{\@upperdegreetitlefalse}
\newif\if@upperfaculty \@upperfacultyfalse
\DeclareOption{upperfaculty}{\@upperfacultytrue}
\DeclareOption{noupperfaculty}{\@upperfacultyfalse}
\newif\if@upperdepartment \@upperdepartmentfalse
\DeclareOption{upperdepartment}{\@upperdepartmenttrue}
\DeclareOption{noupperdepartment}{\@upperdepartmentfalse}
\newif\if@upperinstitution \@upperinstitutiontrue
\DeclareOption{upperinstitution}{\@upperinstitutiontrue}
\DeclareOption{noupperinstitution}{\@upperinstitutionfalse}
```

phd
msc
masc
ma
meng

These options changes the title of the degree according to the type of degree. The `\degreetitle` command can be used to override this.

```
\DeclareOption{phd}{
  \degreetitle{Doctor of Philosophy}
  \numberofsignatures{4}
}
\DeclareOption{msc}{
  \degreetitle{Master of Science}
  \numberofsignatures{2}
}
\DeclareOption{masc}{
  \degreetitle{Master of Applied Science}
  \numberofsignatures{2}
}
\DeclareOption{ma}{
  \degreetitle{Master of Arts}
  \numberofsignatures{2}
```

```
}
\DeclareOption{meng}{
  \degreetitle{Master of Engineering}%
  \numberofsignatures{2}
  }
```

`logo` `nologo` These options control the display of an institution logo on the titlepage. You must define the graphic to be used by using the `\insitutionlogo` command.

```
\newif\iflogo\logofalse
\DeclareOption{logo}{\logotrue}
\DeclareOption{nologo}{\logofalse}
```

21.11 Headings

`chapterheads` `nochapterheads` These determine if the section headings are uppercase and if chapter headings should be displayed before the chapter title.

```
\newif\if@chapterheads \@chapterheadstrue
\DeclareOption{chapterheads}{\@chapterheadstrue}
\DeclareOption{nochapterheads}{\@chapterheadsfalse}
\newif\if@headcount \@headcounttrue
```

`partheads` `nopartheads` These determine if the section headings are uppercase and if part headings should be displayed before the part title.

```
\newif\if@partheads \@partheadstrue
\DeclareOption{partheads}{\@partheadstrue}
\DeclareOption{nopartheads}{\@partheadsfalse}
\newif\if@headcount \@headcounttrue
```

`headcount` `noheadcount` These options determine if the numbers should be displayed in the chapter and part headings.

```
\DeclareOption{headcount}{\@headcounttrue}
\DeclareOption{noheadcount}{\@headcountfalse}
```

`upper` `noupper` These options determine if the headings (part, chapter, sections etc.) should be converted to uppercase. This option is good if the font size of the headings is not much larger than the body text.

```
\newif\if@upper \@upperfalse
\DeclareOption{upper}{\@uppertrue}
\DeclareOption{noupper}{\@upperfalse}
```

`tocupper` `notocupper` These options determine if the table of contents should be converted to uppercase.

```
\newif\if@tocupper \@tocupperfalse
\DeclareOption{tocupper}{\@tocuppertrue}
\DeclareOption{notocupper}{\@tocupperfalse}
```

`leftheads` `centerheads` `rightheads` `\@headingalignment` These options affect the display of several things including the part pages and headers. This uses the variable `\@headingalignment`.

```
\newcommand\@headingalignment{\raggedright}
\DeclareOption{leftheads}{\renewcommand\@headingalignment{\raggedleft}}
\DeclareOption{centerheads}{\renewcommand\@headingalignment{\centering}}
\DeclareOption{rightheads}{\renewcommand\@headingalignment{\raggedright}}
```

21.12 Figures and Tables

`hangingcaptions`
`nohangingcaptions`

These options determine whether or not figure and table captions should "hang". Hanging captions are justified so that all the caption text comes after the caption label.

```
\newif\if@hangingcaptions \@hangingcaptionstrue
\DeclareOption{hangingcaptions}{\@hangingcaptionstrue}
\DeclareOption{nohangingcaptions}{\@hangingcaptionsfalse}
```

21.13 Appendix

`appendixpart`
`noappendixpart`

These options affect whether or not the Appendices are a separate "part" or just chapters.

```
\newif\if@appendixpart \@appendixpartfalse
\DeclareOption{appendixpart}{\@appendixparttrue}
\DeclareOption{noappendixpart}{\@appendixpartfalse}
```

`appendixpage`
`noappendixpage`

These decide if the appendices should have a separate page if they are actually chapters. If appendixpart is chosen then these have no effect.

```
\newif\if@appendixpage \@appendixpagetrue
\DeclareOption{appendixpage}{\@appendixpagetrue}
\DeclareOption{noappendixpage}{\@appendixpagefalse}
```

21.14 Open bibliography

`openbib`

The option openbib produces the "open" bibliography style, in which each block starts on a new line, and succeeding lines in a block are indented by `\bibindent`.

```
\DeclareOption{openbib}{%
```

First some hook into the bibliography environment is filled.

```
  \AtEndOfPackage{%
   \renewcommand\@openbib@code{%
      \advance\leftmargin\bibindent
      \itemindent -\bibindent
      \listparindent \itemindent
      \parsep \z@
      }%
```

In addition the definition of `\newblock` is overwritten.

```
  \renewcommand\newblock{\par}}%
}
```

21.15 Crosshairs on empty pages.

`crosshair`
`nocrosshair`

These toggle between crosshair and nocrosshair modes. The crosshair mode puts a large X on empty pages. (Pages with pagestyle *empty*).

```
\newif\if@crosshair \@crosshairtrue
\DeclareOption{crosshair}{\@crosshairfalse}
\DeclareOption{crosshair}{\@crosshairtrue}
```

21.16 Font Options

These are different options for document fonts and spacings in the section headings etc.

`defaultfonts`

```
\DeclareOption{defaultfonts}{
    \renewcommand\titlepagefont{\normalsize}
    \renewcommand\titlefont{\Large}
    \renewcommand\subtitlefont{\large}
    \renewcommand\institutionfont{\slshape}
    \renewcommand\abstractfont{\large\slshape}
    \renewcommand\partfont{\huge \bfseries}
    \renewcommand\partnamefont{\Huge \bfseries}
    \renewcommand\chapterfont{\huge\bfseries}
    \renewcommand\chaptertitlefont{\Huge\bfseries}
    \renewcommand\chapterauthorfont{\large}
    \renewcommand\sectionfont{\Large\bfseries}
    \renewcommand\subsectionfont{\large\bfseries}
    \renewcommand\subsubsectionfont{\normalsize\bfseries}
    \renewcommand\paragraphfont{\normalsize\bfseries}
    \renewcommand\subparagraphfont{\normalsize\bfseries}
    \renewcommand\translatorfont{}
    \renewcommand\theoremheaderfont{\upshape}
    \renewcommand\theorembodyfont{}
    \renewcommand\itemfont{\slshape}
    \renewcommand\examplefont{}
    \renewcommand\headingstextfont{\slshape}
    \renewcommand\pagenumberfont{}
    \renewcommand\captionheaderfont{}
    \renewcommand\captionbodyfont{}
    \renewcommand\figurefont{}
    \renewcommand\tablefont{}
    \setlength{\partbetweenskip}{20pt}
    \setlength{\chapterbeforeskip}{30pt}
    \setlength{\chapterbetweenskip}{20pt}
    \setlength{\chapterafterskip}{30pt}
    \renewcommand\sectionindent{\z@}
    \renewcommand\sectionbeforeskip{-3.5ex \@plus -1ex \@minus -.2ex}
    \renewcommand\sectionafterskip{2.3ex \@plus.2ex}
    \renewcommand\subsectionindent{\z@}
    \renewcommand\subsectionbeforeskip{-3.25ex \@plus -1ex \@minus -.2ex}
    \renewcommand\subsectionafterskip{1.5ex \@plus.2ex}
    \renewcommand\subsubsectionindent{\z@}
    \renewcommand\subsubsectionbeforeskip{-3.25ex\@plus -1ex \@minus -.2ex}
    \renewcommand\subsubsectionafterskip{1.5ex \@plus .2ex}
    \renewcommand\paragraphindent{\z@}
    \renewcommand\paragraphbeforeskip{3.25ex \@plus1ex \@minus.2ex}
    \renewcommand\paragraphafterskip{-1em}
    \renewcommand\subparagraphindent{\parindent}
    \renewcommand\subparagraphbeforeskip{3.25ex \@plus1ex \@minus .2ex}
    \renewcommand\subparagraphafterskip{-1em}
}
```

slanted

```
\DeclareOption{slanted}{
    \renewcommand\titlefont{\LARGE}
    \renewcommand\abstractfont{\large\slshape}
    \renewcommand\subtitlefont{\large}
    \renewcommand\authorfont{}
    \renewcommand\degreetitlefont{\large}
    \renewcommand\partfont{\Large}
    \renewcommand\chapterfont{\large}
    \renewcommand\chaptertitlefont{\large}
    \renewcommand\chapterauthorfont{\large}
    \renewcommand\sectionfont{\large\slshape}
    \renewcommand\subsectionfont{\slshape}
    \renewcommand\subsubsectionfont{\slshape}
    \renewcommand\paragraphfont{\slshape}
    \renewcommand\subparagraphfont{\slshape}
    \renewcommand\institutionfont{\slshape}
    \renewcommand\translatorfont{}
    \renewcommand\theoremheaderfont{\upshape}
    \renewcommand\theorembodyfont{}
    \renewcommand\itemfont{\slshape}
    \renewcommand\examplefont{}
    \renewcommand\headingstextfont{\small\slshape}
    \renewcommand\pagenumberfont{\small}
    \renewcommand\captionheaderfont{\slshape\small}
    \renewcommand\captionbodyfont{\small}
    \renewcommand\figurefont{}
    \renewcommand\tablefont{}
    \setlength{\partbetweenskip}{20pt}
    \setlength{\chapterbeforeskip}{30pt}
    \setlength{\chapterbetweenskip}{20pt}
    \setlength{\chapterafterskip}{30pt}
    \renewcommand\sectionindent{\z@}
    \renewcommand\sectionbeforeskip{-3.5ex \@plus -1ex \@minus -.2ex}
    \renewcommand\sectionafterskip{2.3ex \@plus.2ex}
    \renewcommand\subsectionindent{\z@}
    \renewcommand\subsectionbeforeskip{-3.25ex \@plus -1ex \@minus -.2ex}
    \renewcommand\subsectionafterskip{1.5ex \@plus.2ex}
    \renewcommand\subsubsectionindent{\z@}
    \renewcommand\subsubsectionbeforeskip{-3.25ex\@plus -1ex \@minus -.2ex}
    \renewcommand\subsubsectionafterskip{1.5ex \@plus .2ex}
    \renewcommand\paragraphindent{\z@}
    \renewcommand\paragraphbeforeskip{3.25ex \@plus1ex \@minus.2ex}
    \renewcommand\paragraphafterskip{-1em}
    \renewcommand\subparagraphindent{\parindent}
    \renewcommand\subparagraphbeforeskip{3.25ex \@plus1ex \@minus .2ex}
    \renewcommand\subparagraphafterskip{-1em}
}
```

bold

```
\DeclareOption{bold}{%
    \renewcommand\titlefont{\LARGE\bfseries}
    \renewcommand\subtitlefont{\large\bfseries}
    \renewcommand\abstractfont{\Large\bfseries}
```

```
    \renewcommand\authorfont{}
    \renewcommand\degreetitlefont{\large\bfseries}
    \renewcommand\partfont{\LARGE\bfseries}
    \renewcommand\chapterfont{\LARGE\bfseries}
    \renewcommand\chaptertitlefont{\LARGE\bfseries}
    \renewcommand\chapterauthorfont{\large}
    \renewcommand\sectionfont{\Large\bfseries}
    \renewcommand\subsectionfont{\large\bfseries}
    \renewcommand\subsubsectionfont{\bfseries}
    \renewcommand\paragraphfont{\bfseries}
    \renewcommand\subparagraphfont{\bfseries}
    \renewcommand\translatorfont{}
    \renewcommand\institutionfont{\slshape}
    \renewcommand\theoremheaderfont{\bfseries}
    \renewcommand\theorembodyfont{\itshape}
    \renewcommand\itemfont{\bfseries}
    \renewcommand\examplefont{}
    \renewcommand\headingstextfont{\small\bfseries}
    \renewcommand\pagenumberfont{\small}
    \renewcommand\captionheaderfont{\bfseries}
    \renewcommand\captionbodyfont{}
    \renewcommand\figurefont{}
    \renewcommand\tablefont{}
    \setlength{\partbetweenskip}{20pt}
    \setlength{\chapterbeforeskip}{30pt}
    \setlength{\chapterbetweenskip}{20pt}
    \setlength{\chapterafterskip}{30pt}
    \renewcommand\sectionindent{\z@}
    \renewcommand\sectionbeforeskip{-3.5ex \@plus -1ex \@minus -.2ex}
    \renewcommand\sectionafterskip{2.3ex \@plus.2ex}
    \renewcommand\subsectionindent{\z@}
    \renewcommand\subsectionbeforeskip{-3.25ex \@plus -1ex \@minus -.2ex}
    \renewcommand\subsectionafterskip{1.5ex \@plus.2ex}
    \renewcommand\subsubsectionindent{\z@}
    \renewcommand\subsubsectionbeforeskip{-3.25ex\@plus -1ex \@minus -.2ex}
    \renewcommand\subsubsectionafterskip{1.5ex \@plus .2ex}
    \renewcommand\paragraphindent{\z@}
    \renewcommand\paragraphbeforeskip{3.25ex \@plus1ex \@minus.2ex}
    \renewcommand\paragraphafterskip{-1em}
    \renewcommand\subparagraphindent{\parindent}
    \renewcommand\subparagraphbeforeskip{3.25ex \@plus1ex \@minus .2ex}
    \renewcommand\subparagraphafterskip{-1em}
}
```

sfbold

```
\DeclareOption{sfbold}{%
    \renewcommand\titlefont{\LARGE\sffamily\bfseries}
    \renewcommand\abstractfont{\large\sffamily\bfseries}
    \renewcommand\subtitlefont{\large\sffamily}
    \renewcommand\authorfont{\Large\sffamily\slshape}
    \renewcommand\degreetitlefont{\large\sffamily}
    \renewcommand\partfont{\LARGE\sffamily\bfseries}
    \renewcommand\chapterfont{\LARGE\sffamily\bfseries}
    \renewcommand\chaptertitlefont{\LARGE\sffamily\bfseries}
```

```
    \renewcommand\chapterauthorfont{\Large\sffamily\bfseries}
    \renewcommand\sectionfont{\large\sffamily\bfseries}
    \renewcommand\subsectionfont{\large\sffamily\bfseries}
    \renewcommand\subsubsectionfont{\sffamily\bfseries}
    \renewcommand\paragraphfont{\sffamily\bfseries}
    \renewcommand\subparagraphfont{\sffamily}
    \renewcommand\translatorfont{}
    \renewcommand\institutionfont{\sffamily}
    \renewcommand\theoremheaderfont{\sffamily}
    \renewcommand\theorembodyfont{}
    \renewcommand\itemfont{\sffamily}
    \renewcommand\examplefont{}
    \renewcommand\headingstextfont{\small\sffamily}
    \renewcommand\pagenumberfont{\small\rmfamily}
    \renewcommand\captionheaderfont{\sffamily}
    \renewcommand\captionbodyfont{}
    \renewcommand\figurefont{}
    \renewcommand\tablefont{}
    \setlength{\partbetweenskip}{20pt}
    \setlength{\chapterbeforeskip}{30pt}
    \setlength{\chapterbetweenskip}{20pt}
    \setlength{\chapterafterskip}{30pt}
    \renewcommand\sectionindent{\z@}
    \renewcommand\sectionbeforeskip{-3.5ex \@plus -1ex \@minus -.2ex}
    \renewcommand\sectionafterskip{2.3ex \@plus.2ex}
    \renewcommand\subsectionindent{\z@}
    \renewcommand\subsectionbeforeskip{-3.25ex \@plus -1ex \@minus -.2ex}
    \renewcommand\subsectionafterskip{1.5ex \@plus.2ex}
    \renewcommand\subsubsectionindent{\z@}
    \renewcommand\subsubsectionbeforeskip{-3.25ex\@plus -1ex \@minus -.2ex}
    \renewcommand\subsubsectionafterskip{1.5ex \@plus .2ex}
    \renewcommand\paragraphindent{\z@}
    \renewcommand\paragraphbeforeskip{3.25ex \@plus1ex \@minus.2ex}
    \renewcommand\paragraphafterskip{-1em}
    \renewcommand\subparagraphindent{\parindent}
    \renewcommand\subparagraphbeforeskip{3.25ex \@plus1ex \@minus .2ex}
    \renewcommand\subparagraphafterskip{-1em}
}
```

22 Executing Options

Here we execute the default options to initialize certain variables. Note that we need the percent signs to break the lines.

```
\ExecuteOptions{%
  letterpaper,%
  10pt,%
  twoside,%
  onecolumn,%
  final,%
  openright,%
  noupper,%
  defaultfonts,%
  nologo}
```

The `\ProcessOptions` command causes the execution of the code for every option FOO which is declared and for which the user typed the FOO option in his `\documentclass` command. For every option BAR he typed, which is not declared, the option is assumed to be a global option. All options will be passed as document options to any `\usepackage` command in the document preamble.

```
\ProcessOptions
```

Now that all the options have been executed we can load the chosen class option file that contains all size dependent code.

```
\input{bk1\@ptsize.clo}
```

23 Loading Packages

If a logo is to be displayed on the titlepage, then the `graphics` package must be loaded

```
\iflogo\RequirePackage{graphics}\fi
```

24 Document Layout

In this section we are finally dealing with the nasty typographical details.

24.1 Paragraphing

`\lineskip` `\normallineskip` These parameters control TEX's behaviour when two lines tend to come too close together.

```
\setlength\lineskip{1\p@}
\setlength\normallineskip{1\p@}
```

`\baselinestretch` This is used as a multiplier for `\baselineskip`. The default is to *not* stretch the baselines. Note that if this command doesn't resolve to "empty" any `plus` or `minus` part in the specification of `\baselineskip` is ignored.

```
\renewcommand\baselinestretch{}
```

`\parskip` `\parindent` `\parskip` gives extra vertical space between paragraphs and `\parindent` is the width of the paragraph indentation. The value of `\parindent` depends on whether we are in two column mode.

```
\setlength\parskip{0\p@ \@plus \p@}
```

`\@lowpenalty` `\@medpenalty` `\@highpenalty` The commands `\nopagebreak` and `\nolinebreak` put in penalties to discourage these breaks at the point they are put in. They use `\@lowpenalty`, `\@medpenalty` or `\@highpenalty`, dependent on their argument.

```
\@lowpenalty   51
\@medpenalty  151
\@highpenalty 301
```

`\clubpenalty` `\widowpenalty` These penalties are use to discourage club and widow lines. Because we use their default values we only show them here, commented out.

```
% \clubpenalty  150
% \widowpenalty 150
```

`\displaywidowpenalty` `\predisplaypenalty` `\postdisplaypenalty`

Discourage (but not so much) widows in front of a math display and forbid breaking directly in front of a display. Allow break after a display without a penalty. Again the default values are used, therefore we only show them here.

```
% \displaywidowpenalty 50
% \predisplaypenalty   10000
% \postdisplaypenalty  0
```

`\interlinepenalty`

Allow the breaking of a page in the middle of a paragraph.

```
% \interlinepenalty 0
```

`\brokenpenalty`

We allow the breaking of a page after a hyphenated line.

```
% \brokenpenalty 100
```

24.2 Page Layout

All margin dimensions are measured from a point one inch from the top and lefthand side of the page.

24.2.1 Float placement parameters

All float parameters are given default values in the LaTeX 2_ε kernel. For this reason parameters that are not counters need to be set with `\renewcommand`.

Limits for the placement of floating objects

`\c@topnumber`

The *topnumber* counter holds the maximum number of floats that can appear on the top of a text page.

```
\setcounter{topnumber}{2}
```

`\topfraction`

This indicates the maximum part of a text page that can be occupied by floats at the top.

```
\renewcommand\topfraction{.7}
```

`\c@bottomnumber`

The *bottomnumber* counter holds the maximum number of floats that can appear on the bottom of a text page.

```
\setcounter{bottomnumber}{1}
```

`\bottomfraction`

This indicates the maximum part of a text page that can be occupied by floats at the bottom.

```
\renewcommand\bottomfraction{.3}
```

`\c@totalnumber`

This indicates the maximum number of floats that can appear on any text page.

```
\setcounter{totalnumber}{3}
```

`\textfraction`

This indicates the minimum part of a text page that has to be occupied by text.

```
\renewcommand\textfraction{.2}
```

`\floatpagefraction`

This indicates the minimum part of a page that has to be occupied by floating objects before a ‘float page’ is produced.

```
\renewcommand\floatpagefraction{.5}
```

`\c@dbltopnumber` The *dbltopnumber* counter holds the maximum number of two column floats that can appear on the top of a two column text page.

```
\setcounter{dbltopnumber}{2}
```

`\dbltopfraction` This indicates the maximum part of a two column text page that can be occupied by two column floats at the top.

```
\renewcommand\dbltopfraction{.7}
```

`\dblfloatpagefraction` This indicates the minimum part of a page that has to be occupied by two column wide floating objects before a 'float page' is produced.

```
\renewcommand\dblfloatpagefraction{.5}
```

24.3 Page Styles

The page style *foo* is defined by defining the command `\ps@foo`. This command should make only local definitions. There should be no stray spaces in the definition, since they could lead to mysterious extra spaces in the output (well, that's something that should be always avoided).

`\@evenhead` `\@oddhead` `\@evenfoot` `\@oddfoot` The `\ps@...` command defines the macros `\@oddhead`, `\@oddfoot`, `\@evenhead`, and `\@evenfoot` to define the running heads and feet—e.g., `\@oddhead` is the macro to produce the contents of the heading box for odd-numbered pages. It is called inside an `\hbox` of width `\textwidth`.

24.3.1 Marking conventions

To make headings determined by the sectioning commands, the page style defines the commands `\chaptermark`, `\sectionmark`, ... ,
where `\chaptermark{`⟨*TEXT*⟩`}` is called by `\chapter` to set a mark, and so on.

The `\...mark` commands and the `\...head` macros are defined with the help of the following macros. (All the `\...mark` commands should be initialized to no-ops.)

LaTeX extends TeX's `\mark` facility by producing two kinds of marks, a 'left' and a 'right' mark, using the following commands:

`\markboth{`⟨*LEFT*⟩`}{`⟨*RIGHT*⟩`}`: Adds both marks.
`\markright{`⟨*RIGHT*⟩`}`: Adds a 'right' mark.
`\leftmark`: Used in the `\@oddhead`, `\@oddfoot`, `\@evenhead` or `\@evenfoot` macros, it gets the current 'left' mark. `\leftmark` works like TeX's `\botmark` command.
`\rightmark`: Used in the `\@oddhead`, `\@oddfoot`, `\@evenhead` or `\@evenfoot` macros, it gets the current 'right' mark. `\rightmark` works like TeX's `\firstmark` command.

The marking commands work reasonably well for right marks 'numbered within' left marks—e.g., the left mark is changed by a `\chapter` command and the right mark is changed by a `\section` command. However, it does produce somewhat anomalous results if two `\markboth`'s occur on the same page.

Commands like `\tableofcontents` that should set the marks in some page styles use a `\@mkboth` command, which is `\let` by the pagestyle command (`\ps@...`) to `\markboth` for setting the heading or to `\@gobbletwo` to do nothing.

24.3.2 Defining the page styles

The pagestyles *empty* and *plain* are defined in `latex.dtx`.

`\headlinespace` This is the separation between the running header text and the line under it if the headline option is used.

```
\newlength{\headlinespace}
\setlength{\headlinespace}{5pt}
```

`\e@skip` This is I am not exactly sure what this does, but it somehow corrects for the centering of the headings. I found this construct in the thesis class and I use it here though I am not sure how it works. We need the extra parens to prevent the font from leaking out.

```
\newcommand{\e@skip}{{\headingstextfont \phantom{y}}}
```

`\ps@plain` The definition of the page style *plain* has to be different for two sided printing than it is for one sided printing. All it displays is the page number: no headline and no marks.

```
\if@twoside
  \def\ps@plain{%
```

The running feet are empty in this page style, the running head contains the page number and one of the marks. We enclose them in a box and put a line underneath if the headline option is selected. We also center it if the centerheadline option is selected.

```
    \let\@oddfoot\@empty\let\@evenfoot\@empty
    \def\@evenhead{%
      \parbox{\textwidth}{%
```

Here we use an `\hfill` rather than an `\hfil` because it seems like `\thepage` contains an `\hfil`, so we need this to push it to the left.

```
        \makebox[\textwidth]{{\pagenumberfont\thepage}\hfill}
```

We do this just to make sure that the headings sit at the same height.

```
        \if@headline\vspace{\headlinespace}\fi}%
    }%
    \def\@oddhead{%
      \parbox{\textwidth}{%
```

Here we use an `\hfill` rather than an `\hfil` because it seems like `\thepage` contains an `\hfil`, so we need this to push it to the right.

```
        \makebox[\textwidth]{\hfill{\pagenumberfont\thepage}}
        \if@headline
          \vspace{\headlinespace}%
        \fi}%
      }%
  }%
```

The definition of `\ps@plain` for one sided printing can be much simpler, because we treat even and odd pages the same. Therefore we don't need to define `\@even....`

```
\else
  \def\ps@plain{%
    \let\@oddfoot\@empty
    \def\@oddhead{%
      \parbox{\textwidth}{%
```

Here we use an `\hfill` rather than an `\hfil` because it seems like `\thepage` contains an `\hfil`, so we need this to push it to the right.

```
        \makebox[\textwidth]{\hfill{\pagenumberfont\thepage}}%
        \if@headline
          \vspace{\headlinespace}%
        \fi}%
    }%
  }%
\fi
```

`\ps@headings` The definition of the page style *headings* has to be different for two sided printing than it is for one sided printing.

```
\if@twoside
  \def\ps@headings{%
```

The running feet are empty in this page style, the running head contains the page number and one of the marks. We enclose them in a box and put a line underneath if the headline option is selected. We also center it if the centerheadline option is selected.

```
      \let\@oddfoot\@empty\let\@evenfoot\@empty
      \def\@evenhead{%
        \parbox{\textwidth}{%
          \makebox[\textwidth]{%
```

Here we use an `\hfill` rather than an `\hfil` because it seems like `\thepage` contains an `\hfil`, so we need this to push it to the right.

```
            {\pagenumberfont\thepage}\hfill{\headingstextfont\leftmark}%
            \e@skip%
            \if@centerheadline\hfill\fi
          }%
        \if@headline
          \vspace{\headlinespace}%
          \hrule%
        \fi}%
      }%
      \def\@oddhead{%
        \parbox{\textwidth}{%
          \makebox[\textwidth]{%
            \if@centerheadline\hfill\fi%
            {\headingstextfont\rightmark}\e@skip\hfill{\pagenumberfont\thepage}%
          }%
        \if@headline
          \vspace{\headlinespace}%
          \hrule%
        \fi}%
      }%
```

When using this page style, the contents of the running head is determined by the chapter and section titles. So we `\let` `\@mkboth` to `\markboth`.

```
      \let\@mkboth\markboth
```

We use the `\chaptermark` and `\sectionmark` macros to fill the running heads.

Note the use of `##1` for the parameter of the `\chaptermark` command, which will be defined when `\ps@headings` is executed.

```
    \def\chaptermark##1{%
      \markboth {
        \ifnum \c@secnumdepth >\m@ne
          \if@mainmatter
            \@toupper{\@chapapp}\
            \if@headcount
               \thechapter. \ %
            \fi
          \fi
        \fi
        \@toupper{##1}}{}}%
    \def\sectionmark##1{%
      \markright {
        \ifnum \c@secnumdepth >\z@
          \if@headcount
            \thesection. \ %
          \fi
        \fi
        \@toupper{##1}}}}
```

The definition of `\ps@headings` for one sided printing can be much simpler, because we treat even and odd pages the same. Therefore we don't need to define `\@even....`

```
\else
  \def\ps@headings{%
    \let\@oddfoot\@empty
    \def\@oddhead{%
```

Here we put the header in a `\parbox` so that we can stack it above a rule is the headline is chosen.

```
      \parbox{\textwidth}{%
        \makebox[\textwidth]{%
```

Here we center with an `\hfill` rather than an `\hfil` because it seems like `\thepage` contains an `\hfil`, so we need this to push it to the right.

```
          \if@centerheadline\hfill\fi%
          {\headingstextfont\rightmark}\e@skip\hfill{\pagenumberfont\thepage}%
        }%
      \if@headline%
        \vspace{\headlinespace}%
        \hrule}%
      \fi%
      }%
    \let\@mkboth\markboth
```

We use `\markright` now instead of `\markboth` as we did for two sided printing.

```
    \def\chaptermark##1{%
      \markright {
        \ifnum \c@secnumdepth >\m@ne
          \if@mainmatter
            \@toupper{\@chapapp\ }
            \if@headcount
              \thechapter. \ %
            \fi
          \fi
```

```
      \fi
      \@toupper{##1}}}}
\fi
```

\ps@draft This is the pagestyle used for a draft version. The headers are modified so that they display the current date and time of the draft.

```
\def\ps@draft{%
  \let\@oddfoot\@empty\let\@evenfoot\@empty
  \def\@oddhead{%
    \parbox{\textwidth}{%
      \makebox[\textwidth]{%
        {\pagenumberfont\today\ \now\ ---%
          {\headingstextfont\draftname: ‘‘\jobname’’}%
          \hfil\e@skip%
          \thepage}%
      }%
      \if@headline
        \vspace{\headlinespace}%
        \hrule%
      \fi
    }%
  }%
  \def\@evenhead{%
    \parbox{\textwidth}{%
      \makebox[\textwidth]{%
        {\pagenumberfont\thepage%
          \e@skip\hfil%
          {\headingstextfont\draftname: ‘‘\jobname’’}%
          --- \today\ \now}%
      }%
      \if@headline
        \vspace{\headlinespace}%
        \hrule%
      \fi
    }%
  }%
  \let\@mkboth\@gobbletwo
  \let\chaptermark\@gobble
  \let\sectionmark\@gobble
}
```

crosshair The crosshair option puts a large X on any page with pagestyle *clear*. This option is taken from the thesis class.

```
\if@crosshair
  \def\clap#1{\hbox to 0pt{\hss#1\hss}} \newdimen\@crosshairrule
  \@crosshairrule=.24pt \def\@crosshairs{\vbox to
    0pt{\hsize=0pt\baselineskip=0pt\lineskip=0pt \vss \clap{\vrule
        height .125in width \@crosshairrule depth 0pt} \clap{\vrule
        width .25in height \@crosshairrule depth 0pt} \clap{\vrule
        height .125in width \@crosshairrule depth 0pt} \vss}}
  \def\ps@clear{%
    \let\@oddfoot\@empty\let\@evenfoot\@empty
    \def\@oddhead{\hfil\raise\headheight\@crosshairs}
```

```
    \let\@evenhead\@oddhead}
\fi
```

\ps@myheadings

The definition of the page style *myheadings* is fairly simple because the user determines the contents of the running head himself by using the `\markboth` and `\markright` commands.

```
\def\ps@myheadings{%
  \let\@oddfoot\@empty\let\@evenfoot\@empty
  \def\@evenhead{%
    \parbox{\textwidth}{%
      \makebox[\textwidth]{%
        {\pagenumberfont\thepage}\hfil{\headingstextfont\leftmark}%
        \e@skip%
        \if@centerheadline\hfil\fi
      }%
    \if@headline
      \vspace{\headlinespace}%
      \hrule%
    \fi}%
  }%
  \def\@oddhead{%
    \parbox{\textwidth}{%
      \makebox[\textwidth]{%
        \if@centerheadline\hfil\fi%
        {\headingstextfont\rightmark}\e@skip\hfil{\pagenumberfont\thepage}%
      }%
      \if@headline
        \vspace{\headlinespace}%
        \hrule%
      \fi}%
    }%
```

We have to make sure that the marking commands that are used by the chapter and section headings are disabled. We do this `\let`ting them to a macro that gobbles its argument(s).

```
  \let\@mkboth\@gobbletwo
  \let\chaptermark\@gobble
  \let\sectionmark\@gobble
  }
```

25 Document Markup

25.1 Title Page

Currently, this document class supports only one style of titlepage which is modeled after the sample displayed by the UBC library in 2001. In future versions, I would like to include various styles of titlepage corresponding to various institutions default formats.

\signatures

This command prints out as many signature lines as dictated by the argument. This is used on the titlepage.

```
\newcommand*{\signatures}[1]{
```

```
  \count0=0
  \loop\ifnum\count0<#1 \advance\count0 by 1
  { \begin{minipage}{4in}
      \par
      \vspace{.25in}
      \hbox to 4in{\dotfill}
    \end{minipage}}
  \endgraf\repeat
  }
```

`\logofile` The macro `\logofile` is used to specify the name of a graphic file to use on the titlepage.

```
\def\@logofile{\@latex@warning@no@line{No \noexpand\logofile\ given}}
\newcommand*{\logofile}[1]{\gdef\@logofile{#1}}
```

`\maketitle` This macro is used in the document to produce the titlepage. The titlepage produced here conforms to the sample displayed by the UBC library in 2001.

```
\newcommand\maketitle{
```

The titlepage should display no headers or page numbers and start on a new page.

```
  \thispagestyle{empty}
  \setcounter{page}\@ne
```

The titlepage should be one column.

```
  \@startonecolumn
```

We would really like to keep the titlepage together on one page. One option would be to put it in a minipage, but instead we increase the size (height) of the page, keeping one inch margins by using the `\enlargethispage*` command (see the documentation for `ltoutput.dtx`). The star form only increases the page height if needed. Also, we reset the line spacing to single spacing.

```
  \setlength\@tempdima{\paperheight}
  \addtolength\@tempdima{-2in}
  \addtolength\@tempdima{-\textheight}
  \enlargethispage*{\@tempdima}
%  \begin{minipage}{0.95\textwidth}
```

Also, we use single spacing, restoring the spacing afterwards. Note: in order for `\baselinestretch` to take effect, the font must be reselected. Here this is done with `\titlepagefont` but at the end we must explicitly call `\selectfont` to force the calculation.

```
    \edef\@tempbaselinestretch{\baselinestretch}
    \renewcommand{\baselinestretch}{1}
    \titlepagefont
```

We center the entire title vertically. `\vfil` is a vertical space (or glue) of infinite stretchability: It will expand and push the page down. An accompanying `\vfil` at the bottom will push up and the page will be centered. Note that `\vfill` works the same way, but that `\vfill` is "more infinite" than `\vfil` so a `\vfill` will always collapse a `\vfil`. The `\null` must be used because, at the top of a new page, rubber space is normally eaten.

```
  \null\vfil
```

Then we set the title in the `\titlefont`; leave a little space, the, if a subtitle has been defined, we put is in `\subtitlefont`, then after a little space we put "by", then leave some space and and set the author(s) in `\authorfont`. We do this inside a tabular environment to get them in a single column. Then we list the previous degrees. We do this in a tabular environment so that the extra newline does not give a problem. Before the date we leave a little whitespace again.

The titlepage is always centered, regardless of the center option.

```
\begin{center}%
  {\titlefont
    \if@uppertitle\MakeUppercase{\@title}\else{\@title}\fi
    \par}%
  \vspace{1em}%
  \if@subtitle
    {\subtitlefont
      \if@uppersubtitle\MakeUppercase{\@subtitle}\else{\@subtitle}\fi
      \par}%
    \vspace{1em}%
  \fi
  by \par%
  \vspace{1em}%
  {\authorfont
    \lineskip .75em%
    \begin{tabular}[t]{c}%
      \if@upperauthor\MakeUppercase{\@author}\else{\@author}\fi
    \end{tabular}\par}%
  \vspace{1em}
  \vfil
  \begin{tabular}[t]{c}
    \@previousdegrees\relax
  \end{tabular}\par%
    \vfil
  A THESIS SUBMITTED IN PARTIAL FULFILMENT OF\par%
  THE REQUIREMENTS FOR THE DEGREE OF\par%
  \vspace{1em}
  {\degreetitlefont
    \if@upperdegreetitle\MakeUppercase{\@degreetitle}\else{\@degreetitle}\fi
    \par}%
  \vspace{1em}
  in \par%
  \vspace{1em}
  {\facultyfont
    \if@upperfaculty\MakeUppercase{\@faculty}\else{\@faculty}\fi
    \par}%
  \vspace{1em}
  (\@department)\par%
  \vspace{1em}
  \vspace{3ex}
  We accept this thesis as conforming \par%
  to the required standard \par%
  \vspace{5ex}
  \signatures{\@numberofsignatures}
  \vspace{5ex}
```

Here we place the university name and copyright. The logo option can be used to include a small graphic logo here to the left of this information. To process this we need to compute the width of the text. Here we define a box with the text and defined the width and height of that box. We are using TeX primitives here:

```
   \setbox0=\vbox{
     \hbox{\if@upperinstitution\MakeUppercase{\@institution}
       \else{\@institution}\fi}
     \hbox{\@submitdate}
     \hbox{\copyright\ \@author, \@copyrightyear}}
   \newlength{\@logocopywidth}
   \setlength{\@logocopywidth}{\wd0}
```

Now we construct the box of text centering the text within the box by using `\hfil`:

```
   \newcommand\@logocopy{\vbox{
       \hbox to\@logocopywidth{%
         \hfil\if@upperinstitution\MakeUppercase{\@institution}
         \else{\@institution}\fi
         \hfil}
       \vspace{1.5ex}
       \hbox to\@logocopywidth{\hfil\@submitdate\hfil}
       \vspace{1.5ex}
       \hbox to\@logocopywidth{%
         \hfil\copyright\ \@author, \@copyrightyear\hfil}}}
   \newlength{\@logocopyheight}
   \settoheight{\@logocopyheight}{\@logocopy}
```

Here we include the logo in a box, or nothing if the logo option is not used and record its width:

```
   \newcommand\@logo{\hbox{
       \iflogo
       \includegraphics*[height=\@logocopyheight]{\@logofile}
       \fi}}
   \newlength{\@logowidth}
   \settowidth{\@logowidth}{\@logo}
```

Now we actually typeset the logo and text centered:

```
   \centerline{\hbox{%
       \hfill\@logo\@logocopy\hspace{\@logowidth}}}
 \end{center}
 \vfil\null
%  \end{minipage}
```

The titlepage should have nothing else on it.

```
 \clearpage
```

Reset column mode. We must do this after the new page has been specified with `\clearpage`.

```
 \@endonecolumn
```

Here we reset the line spacing: Note: in order for `\baselinestretch` to take effect, the font must be reselected. Here this is done with an explicit call to `\selectfont` to force the calculation.

```
 \normalfont
 \normalsize
 \edef\baselinestretch{\@tempbaselinestretch}
```

We reset the *footnote* counter, disable `\thanks` and `\maketitle` and save some storage space by emptying the internal information macros.

```
  \setcounter{footnote}{0}%
  \global\let\thanks\relax
  \global\let\maketitle\relax
  \global\let\@thanks\@empty
  \global\let\@author\@empty
  \global\let\@date\@empty
  \global\let\@title\@empty
```

After the title is set the declaration commands `\title`, etc. can vanish. The definition of `\and` makes only sense within the argument of `\author` so this can go as well.

```
  \global\let\title\relax
  \global\let\author\relax
  \global\let\date\relax
  \global\let\and\relax
}
```

25.2 Authorization Form

This is very university specific. You should add one of your own if you make a class for outside of UBC.

`\ubcauthorizationform`
`\authorizationform`

The `\ubcauthorizationform` is specific to UBC but it is the only one defined so it is also assigned to `\authorizationform`.

```
\newcommand{\ubcauthorizationform}{
```

We clear the page (making sure it opens properly if twopage is selected) and set the pagestyle to empty. Page numbers should not be displayed.

```
  \thispagestyle{clear}
  \cleardoublepage
  \thispagestyle{empty}

  \@startonecolumn
```

We use single spacing, restoring the spacing afterwards. Note: in order for `\baselinestretch` to take effect, the font must be reselected. Here this is done with `\selectfont`.

```
  \edef\@tempbaselinestretch{\baselinestretch}
  \renewcommand{\baselinestretch}{1}
  \selectfont
  In presenting this thesis in partial fulfilment of the requirements
  for an advanced degree at the University of British Columbia, I
  agree that the Library shall make it freely available for reference
  and study. I further agree that permission for extensive copying of
  this thesis for scholarly purposes may be granted by the head of my
  department or by his or her representatives. It is understood that
  copying or publication of this thesis for financial gain shall not
  be allowed without my written permission.

  \vfil
  \begin{flushright}
    (Signature) \rule{2in}{0.5pt}
```

```
 \end{flushright}
 \vfil

 \noindent
 \@department

 \vspace{2em}
 \noindent
 \@institution\par
 \@institutionaddress

 \vspace{2em}
 \noindent
 Date \rule{2in}{0.5pt}

 % The authorization form should not count as a page, but this will
 % be taken care of in the abstract.

%  \addtocounter{page}{-1}
```

Here we force a new page and reset the columns. Note that the columns must be reset after the newpage has been forced.

```
 \clearpage
 \@endonecolumn
```

Here we reset the line spacing: Note: in order for `\baselinestretch` to take effect, the font must be reselected. Here this is done with an explicit call to `\selectfont` to force the calculation.

```
 \edef\baselinestretch{\@tempbaselinestretch}
 \global\let\thanks\relax
 \selectfont
}
```

Here is a command to use the `\ubcauthorization` form. Eventually, there may be several different types for different institutions.

```
\newcommand{\authorizationform}{\ubcauthorizationform}
```

25.3 Preface/Foreword

The preface/foreword should not have a number, but should be listed in the table of contents: hence we define these here.

`\preface` `\foreword`

The only difference between `\preface` and `\foreword` is the name they use.

```
\newcommand{\preface}{\chaptertoc{\prefacename}{\prefacename}}
\newcommand{\foreword}{\chaptertoc{\forewordname}{\forewordname}}
```

25.4 Acknowledgements

`\acknowledgements`

```
\newcommand*{\acknowledgements}{\chaptertoc{\acknowledgementsname}{\acknowledgementsname}}
```

25.5 Parts, Chapters, Sections, Paragraphs etc.

25.5.1 Building blocks

The definitions in this part of the class file make use of two internal macros, `\@startsection` and `\secdef`. To understand what is going on here, we describe their syntax.

The macro `\@startsection` has 6 required arguments, optionally followed by a $*$, an optional argument and a required argument:

`\@startsection`⟨*name*⟩⟨*level*⟩⟨*indent*⟩⟨*beforeskip*⟩⟨*afterskip*⟩⟨*style*⟩ optional *
`[`⟨*altheading*⟩`]`⟨*heading*⟩

It is a generic command to start a section, the arguments have the following meaning:

⟨***name***⟩ The name of the user level command, e.g., 'section'.

⟨***level***⟩ A number, denoting the depth of the section – e.g., chapter=1, section = 2, etc. A section number will be printed if and only if ⟨*level*⟩ = the value of the *secnumdepth* counter.

⟨***indent***⟩ The indentation of the heading from the left margin

⟨***beforeskip***⟩ The absolute value of this argument gives the skip to leave above the heading. If it is negative, then the paragraph indent of the text following the heading is suppressed.

⟨***afterskip***⟩ If positive, this gives the skip to leave below the heading, else it gives the skip to leave to the right of a run-in heading.

⟨***style***⟩ Commands to set the style of the heading.

$*$ When this is missing the heading is numbered and the corresponding counter is incremented.

⟨***altheading***⟩ Gives an alternative heading to use in the table of contents and in the running heads. This should be present when the $*$ form is used.

⟨***heading***⟩ The heading of the new section.

A sectioning command is normally defined to `\@startsection` and its first six arguments.

The macro `\secdef` can be used when a sectioning command is defined without using `\@startsection`. It has two arguments:

`\secdef`⟨*unstarcmds*⟩⟨*starcmds*⟩

⟨***unstarcmds***⟩ Used for the normal form of the sectioning command.

⟨***starcmds***⟩ Used for the $*$-form of the sectioning command.

You can use `\secdef` as follows:

```
\def\chapter { ... \secdef \CMDA \CMDB }
\def\CMDA    [#1]#2{ ... }  % Command to define
                            % \chapter[...]{...}
\def\CMDB    #1{ ... }      % Command to define
                            % \chapter*{...}
```

25.5.2 Mark commands

\chaptermark \sectionmark \subsectionmark \subsubsectionmark \paragraphmark \subparagraphmark

Default initializations of `\...mark` commands. These commands are used in the definition of the page styles (see section 24.3.2) Most of them are already defined by `latex.dtx`, so they are only shown here.

```
\newcommand*\chaptermark[1]{}
% \newcommand*\sectionmark[1]{}
% \newcommand*\subsectionmark[1]{}
% \newcommand*\subsubsectionmark[1]{}
% \newcommand*\paragraphmark[1]{}
% \newcommand*\subparagraphmark[1]{}
```

25.5.3 Define Counters

\c@secnumdepth

The value of the counter *secnumdepth* gives the depth of the highest-level sectioning command that is to produce section numbers.

```
\setcounter{secnumdepth}{2}
```

\c@part \c@chapter \c@section \c@subsection \c@subsubsection \c@paragraph \c@subparagraph

These counters are used for the section numbers. The macro
`\newcounter{`⟨*newctr*⟩`}[`⟨*oldctr*⟩`]`
defines⟨*newctr*⟩ to be a counter, which is reset to zero when counter ⟨*oldctr*⟩ is stepped. Counter ⟨*oldctr*⟩ must already be defined.

```
\newcounter {part}
\newcounter {chapter}
\newcounter {section}[chapter]
\newcounter {subsection}[section]
\newcounter {subsubsection}[subsection]
\newcounter {paragraph}[subsubsection]
\newcounter {subparagraph}[paragraph]
```

\thepart \thechapter \thesection \thesubsection \thesubsubsection \theparagraph \thesubparagraph

For any counter *CTR*, `\theCTR` is a macro that defines the printed version of counter *CTR*. It is defined in terms of the following macros:

`\arabic{`*COUNTER*`}` prints the value of *COUNTER* as an arabic numeral.

`\roman{`*COUNTER*`}` prints the value of *COUNTER* as a lowercase roman numeral.

`\Roman{`*COUNTER*`}` prints the value of *COUNTER* as an uppercase roman numeral.

`\alph{`*COUNTER*`}` prints the value of *COUNTER* as a lowercase letter: 1 = a, 2 = b, etc.

`\Alph{`*COUNTER*`}` prints the value of *COUNTER* as an uppercase letter: 1 = A, 2 = B, etc.

Actually to save space the internal counter representations and the commands operating on those are used.

```
\renewcommand\thepart {\@Roman\c@part}
\renewcommand\thechapter {\@arabic\c@chapter}
\renewcommand\thesection {\thechapter.\@arabic\c@section}
\renewcommand\thesubsection   {\thesection.\@arabic\c@subsection}
\renewcommand\thesubsubsection{\thesubsection .\@arabic\c@subsubsection}
\renewcommand\theparagraph    {\thesubsubsection.\@arabic\c@paragraph}
\renewcommand\thesubparagraph {\theparagraph.\@arabic\c@subparagraph}
```

25.6 Formatting

`\@chapapp` `\@chapapp` is initially defined to be '`\chaptername`'. The `\appendix` command redefines it to be '`\appendixname`'.

```
\newcommand\@chapapp{\chaptername}
```

25.6.1 Front Matter, Main Matter, and Back Matter

A book contains these three (logical) sections. The switch `\@mainmatter` is true iff we are processing Main Matter. When this switch is false, the `\chapter` command does not print chapter numbers.

Here we define the commands that start these sections.

`\frontmatter` This command starts Roman page numbering and turns off chapter numbering. Since this restarts the page numbering from 1, it should also ensure that a right page is used.

```
\newcommand\frontmatter{%
%   \if@openright
    \cleardoublepage
%   \else
%     \clearpage
%   \fi
  \@mainmatterfalse
  \pagenumbering{roman}}
```

`\mainmatter` This command clears the page, starts arabic page numbering and turns on chapter numbering. Since this restarts the page numbering from 1, it should also ensure that a recto page is used.

```
\newcommand\mainmatter{%
%   \if@openright
    \cleardoublepage
%   \else
%     \clearpage
%   \fi
  \@mainmattertrue
  \pagenumbering{arabic}}
```

`\backmatter` This clears the page, turns off chapter numbering and leaves page numbering unchanged.

```
\newcommand\backmatter{%
  \if@openright
    \cleardoublepage
  \else
    \clearpage
  \fi
  \@mainmatterfalse}
```

25.6.2 Parts

`\part` The command to start a new part of our document.

We start a new (righthand) page and make the pagestyle *plain*.

```
\newcommand\part{%
  \if@openright
```

```
    \cleardoublepage
  \else
    \clearpage
  \fi
  \thispagestyle{plain}%
```

When we are making a two column document, this will be a one column page.

```
  \if@twocolumn
    \onecolumn
    \@tempswatrue
  \else
    \@tempswafalse
  \fi
```

We need an empty box to prevent the fil glue from disappearing.

```
  \null\vfil
```

Here we use `\secdef` to indicate which commands to use to make the actual heading.

```
  \secdef\@part\@spart
}
```

`\@part` This macro does the actual formatting of the title of the part. Again the macro is differently defined for the article document class than for the document classes report and book.

When *secnumdepth* is larger than -2 we have a numbered part, otherwise it is unnumbered.

```
\def\@part[#1]#2{%
  \ifnum \c@secnumdepth >-2\relax
    \refstepcounter{part}%
    \addcontentsline{toc}{part}{\thepart\hspace{1em}\@toctoupper{#1}}%
  \else
    \addcontentsline{toc}{part}{\@toctoupper{#1}}%
  \fi
```

We empty the mark registers and center the title on the page if the centering option is true. Also we prevent breaking between lines and reset the font.

```
  \@mkboth{}{}%
  {\centering
    \interlinepenalty \@M
    \normalfont
```

When this is a numbered part we have to print the number.

```
    \if@partheads
      \ifnum \c@secnumdepth >-2\relax
        {\partnamefont\@toupper{\partname}\nobreakspace\thepart\par}
```

We leave some space before we print the title and leave the finishing up to `\@endpart`.

```
        \vspace{\partbetweenskip}
      \fi
    \fi
    {\partnamefont #2\par}%
  }%
  \@endpart
}
```

`\@spart` This macro does the actual formatting of the title of the part when the star form of the user command was used. In this case we *never* print a number. Otherwise the formatting is the same.

```
\def\@spart#1{%
  {\centering
    \interlinepenalty \@M
    \normalfont
    {\partnamefont #1\par}%
  }%
  \@endpart
}
```

`\@endpart` This macro finishes the part page, for both `\@part` and `\@spart`.

First we fill the current page.

```
\def\@endpart{\vfil\newpage
```

Then, when we are in twosided mode and chapters are supposed to be on right hand sides, we produce a completely blank page.

```
  \if@twoside
    \if@openright
      \null
      \thispagestyle{clear}%
      \newpage
    \fi
  \fi
```

When this was a two column document we have to switch back to two column mode.

```
  \if@tempswa
    \twocolumn
  \fi}
```

25.6.3 Chapters

`\chapter` A chapter should always start on a new page therefore we start by calling `\clearpage`. The first page of each chapter is set to use the `plain` pagestyle. This is the default LaTeX class behaviour and expected by some packages such as `fancyhdr`.[1] At a future date, an option may be provided to alter this behaviour. .

```
\newcommand\chapter{\if@openright\cleardoublepage\else\clearpage\fi
                    \thispagestyle{plain}%
```

Then we prevent floats from appearing at the top of this page because it looks weird to see a floating object above a chapter title.

```
                    \global\@topnum\z@
```

Then we suppress the indentation of the first paragraph by setting the switch `\@afterindent` to `false`. We use `\secdef` to specify the macros to use for actually setting the chapter title.

```
                    \@afterindentfalse
                    \secdef\@chapter\@schapter}
```

[1] Actually, the package works fine without this behaviour but the documentation tells the user that they must change the `plain` pagestyle in order to affect these pages. Now following these instructions should work as expected.

`\@chapter` This macro is called when we have a numbered chapter. When *secnumdepth* is larger than -1 and when `\@mainmatter` is true, we display the chapter number. We also inform the user that a new chapter is about to be typeset by writing a message to the terminal.

```
\def\@chapter[#1]#2{\ifnum \c@secnumdepth >\m@ne
                        \if@mainmatter
                          \refstepcounter{chapter}%
                          \typeout{\@chapapp\space\thechapter.}%
                          \addcontentsline{toc}{chapter}%
                                    {\protect\numberline{\thechapter}\@toctoupper{#1}}%
                        \else
                          \addcontentsline{toc}{chapter}{\@toctoupper{#1}}%
                        \fi
                     \else
                       \addcontentsline{toc}{chapter}{\@toctoupper{#1}}%
                     \fi
```

After having written an entry to the table of contents we store the (alternative) title of this chapter with `\chaptermark` and add some white space to the lists of figures and tables.

```
                     \chaptermark{#1}%
                     \addtocontents{lof}{\protect\addvspace{10\p@}}%
                     \addtocontents{lot}{\protect\addvspace{10\p@}}%
```

Then we call upon `\@makechapterhead` to format the actual chapter title. We have to do this in a special way when we are in twocolumn mode in order to have the chapter title use the entire `\textwidth`. In one column mode we call `\@afterheading` which takes care of suppressing the indentation.

```
                     \if@twocolumn
                       \@topnewpage[\@makechapterhead{#2}]%
                     \else
                       \@makechapterhead{#2}%
                       \@afterheading
                     \fi}
```

`\@makechapterhead` The macro above uses `\@makechapterhead`⟨*text*⟩ to format the heading of the chapter.

We begin by leaving some white space. The we open a group in which we have a paragraph indent of 0pt, and in which we have the text set ragged right. We also reset the font.

```
\def\@makechapterhead#1{%
```

Here we would like to move the chapter label up if the label is displayed so that the actual chapter titles all appear on the same level. We test the flag `\@chapterheads` to see if we should display the chapter heading. This can be toggled with the chapterheads and nochapterheads options.

```
  \setlength{\@tempdima}{\chapterbeforeskip}
  \if@chapterheads
    \if@mainmatter
      \settoheight{\@tempdimb}{
        \chapterfont
        \@toupper{\@chapapp}
        \space
```

```
      \thechapter}
    \addtolength{\@tempdima}{-\@tempdimb}
    \addtolength{\@tempdima}{-\chapterbetweenskip}
  \fi
\fi
\vspace*{\@tempdima}%
{\parindent \z@
  \@headingalignment \normalfont
  \interlinepenalty\@M
```

Then we check whether the number of the chapter has to be printed. If so we leave some whitespace between the chapter number and its title. The option headcount is used to toggle the display of the number.

```
  \ifnum \c@secnumdepth >\m@ne
    \if@chapterheads
      \if@mainmatter
        {\chapterfont%
          \@toupper{\@chapapp}%
          \if@headcount\space\thechapter\fi
        }%
        \par\nobreak
        \vspace{\chapterbetweenskip}
      \fi
    \fi
  \fi
```

Now we set the title in `\chaptertitlefont`. We prevent a page break from occuring in the middle of or after the title. Finally we leave `\chapterafterskip` whitespace before the text begins. If we are not displaying the chapter headings, then we add the number to the chapter titles.

```
  \interlinepenalty\@M
  {\chaptertitlefont %
    \if@chapterheads\else
      \if@headcount
        \thechapter.\space%
      \fi
    \fi
    \@toupper{#1}%
  \par\nobreak}
  \vspace*{\chapterafterskip}%
 }
}
```

`\@schapter` This macro is called when we have an unnumbered chapter. It is much simpler than `\@chapter` because it only needs to typeset the chapter title.

```
\def\@schapter#1{\if@twocolumn
                   \@topnewpage[\@makeschapterhead{#1}]%
                 \else
                   \@makeschapterhead{#1}%
                   \@afterheading
                 \fi}
```

`\@makeschapterhead` The macro above uses `\@makeschapterhead`⟨*text*⟩to format the heading of the chapter. It is similar to `\@makechapterhead` except that it never has to print a chapter number.

```
\def\@makeschapterhead#1{%
  \vspace*{\chapterbeforeskip}%
  {\parindent \z@
    \@headingalignment
    \normalfont
    \interlinepenalty\@M
    {\chaptertitlefont \@toupper{#1}%
    \par\nobreak}
    \vspace*{\chapterafterskip}%
  }
}
```

25.6.4 Lower level headings

These commands all make use of `\@startsection`.

`\section` This gives a normal heading with white space above and below the heading, the title set in `\sectionfont`, and no indentation on the first paragraph. Note that we check for optional arguments and perform all uppercase conversion here. This used to cause problems with the `hyperref` package when we put the uppercase in when writing the table of contents. Now the uppercase is put into the table of contents file.

The starred version of these commands is provided by using the `\@ifstar` macro to convert the name of the section command to one of `\@section` or `\@sectionstar`. These are the commands that actually do all the work.

```
\newcommand*{\section}{\@ifstar\@sectionstar\@section}%
\newcommand\@section[2][]{%
  \@startsection {section}{1}{\sectionindent}%
                 {\sectionbeforeskip}%
                 {\sectionafterskip}%
                 {\@headingalignment\normalfont\sectionfont}%
                 [\@toctoupper{\ifx\empty#1\empty%
                   #2%
                 \else%
                   #1%
                 \fi}]{#2}}
\newcommand\@sectionstar[2][]{%
  \@startsection{section}{1}{\sectionindent}%
                {\sectionbeforeskip}%
                {\sectionafterskip}%
                {\@headingalignment\normalfont\sectionfont}*{#2}}
```

`\subsection` This gives a normal heading with white space above and below the heading, the title set in `\large\bfseries`, and no indentation on the first paragraph.

```
\newcommand*{\subsection}{\@ifstar\@subsectionstar\@subsection}%
\newcommand\@subsection[2][]{%
  \@startsection {subsection}{2}{\subsectionindent}%
                 {\subsectionbeforeskip}%
                 {\subsectionafterskip}%
                 {\@headingalignment\normalfont\subsectionfont}%
```

```
                 [\@toctoupper{\ifx\empty#1\empty%
                   #2%
                 \else%
                   #1%
                 \fi}]{#2}}
\newcommand\@subsectionstar[2][]{%
  \@startsection{subsection}{2}{\subsectionindent}%
                {\subsectionbeforeskip}%
                {\subsectionafterskip}%
                {\@headingalignment\normalfont\subsectionfont}*{#2}}
```

\subsubsection This gives a normal heading with white space above and below the heading, the title set in \normalsize\bfseries, and no indentation on the first paragraph.

```
\newcommand*{\subsubsection}{\@ifstar\@subsubsectionstar\@subsubsection}%
\newcommand\@subsubsection[2][]{%
  \@startsection {subsubsection}{3}{\subsubsectionindent}%
                 {\subsubsectionbeforeskip}%
                 {\subsubsectionafterskip}%
                 {\@headingalignment\normalfont\subsubsectionfont}%
                 [\@toctoupper{\ifx\empty#1\empty%
                   #2%
                 \else%
                   #1%
                 \fi}]{#2}}
\newcommand\@subsubsectionstar[2][]{%
  \@startsection{subsubsection}{3}{\subsubsectionindent}%
                {\subsubsectionbeforeskip}%
                {\subsubsectionafterskip}%
                {\@headingalignment\normalfont\subsubsectionfont}*{#2}}
```

\paragraph This gives a run-in heading with white space above and to the right of the heading, the title set in \normalsize\bfseries.

```
\newcommand*{\paragraph}{\@ifstar\@paragraphstar\@paragraph}%
\newcommand\@paragraph[2][]{%
  \@startsection {paragraph}{4}{\paragraphindent}%
                 {\paragraphbeforeskip}%
                 {\paragraphafterskip}%
                 {\@headingalignment\normalfont\paragraphfont}%
                 [\@toctoupper{\ifx\empty#1\empty%
                   #2%
                 \else%
                   #1%
                 \fi}]{#2}}
\newcommand\@paragraphstar[2][]{%
  \@startsection{paragraph}{4}{\paragraphindent}%
                {\paragraphbeforeskip}%
                {\paragraphafterskip}%
                {\@headingalignment\normalfont\paragraphfont}*{#2}}
```

\subparagraph This gives an indented run-in heading with white space above and to the right of the heading, the title set in \normalsize\bfseries.

```
\newcommand*{\subparagraph}{\@ifstar\@subparagraphstar\@subparagraph}%
```

```
\newcommand\@subparagraph[2][]{%
  \@startsection {subparagraph}{5}{\subparagraphindent}%
                 {\subparagraphbeforeskip}%
                 {\subparagraphafterskip}%
                 {\@headingalignment\normalfont\subparagraphfont}%
                 [\@toctoupper{\ifx\empty#1\empty%
                   #2%
                 \else%
                   #1%
                 \fi}]{#2}}
\newcommand\@subparagraphstar[2][]{%
  \@startsection{subparagraph}{5}{\subparagraphindent}%
                {\subparagraphbeforeskip}%
                {\subparagraphafterskip}%
                {\@headingalignment\normalfont\subparagraphfont}*{#2}}
```

25.7 Alternatives for Table of Contents

\parttoc \chaptertoc \sectiontoc \subsectiontoc \subsubsectiontoc \paragraphtoc \subparagraphtoc

These new sectioning commands allow the user to specify different section titles than entered in the toc. The starred form does not number the section.

```
\newcommand*{\parttoc}[2]{
  \def\@tempname{\@toupper{#1}}
  \part*{\@tempname}
  \@mkboth{\@tempname}{\@tempname}
  \addcontentsline{toc}{part}{\@toctoupper{#2}}
  }
\newcommand*{\chaptertoc}[2]{
  \def\@tempname{\@toupper{#1}}
  \chapter*{\@tempname}
  \@mkboth{\@tempname}{\@tempname}
  \addcontentsline{toc}{chapter}{\@toctoupper{#2}}
  }
\newcommand*{\sectiontoc}[2]{
  \def\@tempname{\@toupper{#1}}
  \section*{\@tempname}
  \@mkboth{\@tempname}{\@tempname}
  \addcontentsline{toc}{section}{\@toctoupper{#2}}
  }
\newcommand*{\subsectiontoc}[2]{
  \def\@tempname{\@toupper{#1}}
  \subsection*{\@tempname}
  \@mkboth{\@tempname}{\@tempname}
  \addcontentsline{toc}{subsection}{\@toctoupper{#2}}
  }
\newcommand*{\subsubsectiontoc}[2]{
  \def\@tempname{\@toupper{#1}}
  \subsubsection*{\@tempname}
  \@mkboth{\@tempname}{\@tempname}
  \addcontentsline{toc}{subsubsection}{\@toctoupper{#2}}
  }
\newcommand*{\paragraphtoc}[2]{
  \def\@tempname{\@toupper{#1}}
  \paragraph*{\@tempname}
  \@mkboth{\@tempname}{\@tempname}
```

```
  \addcontentsline{toc}{paragraph}{\@toctoupper{#2}}
  }
\newcommand*{\subparagraphtoc}[2]{
  \def\@tempname{\@toupper{#1}}
  \subparagraph*{\@tempname}
  \@mkboth{\@tempname}{\@tempname}
  \addcontentsline{toc}{subparagraph}{\@toctoupper{#2}}
  }
```

25.8 Lists

25.8.1 General List Parameters

The following commands are used to set the default values for the list environment's parameters. See the LaTeX manual for an explanation of the meanings of the parameters. Defaults for the list environment are set as follows. First, `\rightmargin`, `\listparindent` and `\itemindent` are set to 0pt. Then, for a Kth level list, the command `\@listK` is called, where 'K' denotes 'i', ''i', ... , 'vi'. (I.e., `\@listiii` is called for a third-level list.) By convention, `\@listK` should set `\leftmargin` to `\leftmarginK`.

`\leftmargin` `\leftmargini` `\leftmarginii` `\leftmarginiii` `\leftmarginiv` `\leftmarginv` `\leftmarginvi`

When we are in two column mode some of the margins are set somewhat smaller.

```
\if@twocolumn
  \setlength\leftmargini  {2em}
\else
  \setlength\leftmargini  {2.5em}
\fi
```

Until the whole of the parameter setting in these files is rationalized, we need to set the value of `\leftmargin` at this outer level.

```
\leftmargin  \leftmargini
```

The following three are calculated so that they are larger than the sum of `\labelsep` and the width of the default labels (which are '(m)', 'vii.' and 'M.').

```
\setlength\leftmarginii  {2.2em}
\setlength\leftmarginiii {1.87em}
\setlength\leftmarginiv  {1.7em}
\if@twocolumn
  \setlength\leftmarginv  {.5em}
  \setlength\leftmarginvi {.5em}
\else
  \setlength\leftmarginv  {1em}
  \setlength\leftmarginvi {1em}
\fi
```

`\labelsep` `\labelwidth`

`\labelsep` is the distance between the label and the text of an item; `\labelwidth` is the width of the label.

```
\setlength  \labelsep  {.5em}
\setlength  \labelwidth{\leftmargini}
\addtolength\labelwidth{-\labelsep}
```

`\@beginparpenalty` `\@endparpenalty`

These penalties are inserted before and after a list or paragraph environment. They are set to a bonus value to encourage page breaking at these points.

`\@itempenalty` This penalty is inserted between list items.

```
\@beginparpenalty -\@lowpenalty
\@endparpenalty   -\@lowpenalty
\@itempenalty     -\@lowpenalty
```

25.8.2 Enumerate

The enumerate environment uses four counters: *enumi*, *enumii*, *enumiii* and *enumiv*, where *enumN* controls the numbering of the Nth level enumeration.

`\theenumi` `\theenumii` `\theenumiii` `\theenumiv` The counters are already defined in `latex.dtx`, but their representation is changed here.

```
\renewcommand\theenumi{\@arabic\c@enumi}
\renewcommand\theenumii{\@alph\c@enumii}
\renewcommand\theenumiii{\@roman\c@enumiii}
\renewcommand\theenumiv{\@Alph\c@enumiv}
```

`\labelenumi` `\labelenumii` `\labelenumiii` `\labelenumiv` The label for each item is generated by the commands `\labelenumi` ... `\labelenumiv`.

```
\newcommand\labelenumi{\theenumi.}
\newcommand\labelenumii{(\theenumii)}
\newcommand\labelenumiii{\theenumiii.}
\newcommand\labelenumiv{\theenumiv.}
```

`\p@enumii` `\p@enumiii` `\p@enumiv` The expansion of `\p@enumN\theenumN` defines the output of a `\ref` command when referencing an item of the Nth level of an enumerated list.

```
\renewcommand\p@enumii{\theenumi}
\renewcommand\p@enumiii{\theenumi(\theenumii)}
\renewcommand\p@enumiv{\p@enumiii\theenumiii}
```

25.8.3 Itemize

`\labelitemi` `\labelitemii` `\labelitemiii` `\labelitemiv` Itemization is controlled by four commands: `\labelitemi`, `\labelitemii`, `\labelitemiii`, and `\labelitemiv`, which define the labels of the various itemization levels: the symbols used are bullet, bold en-dash, centered asterisk and centred dot.

```
\newcommand\labelitemi{\textbullet}
\newcommand\labelitemii{\normalfont\bfseries \textendash}
\newcommand\labelitemiii{\textasteriskcentered}
\newcommand\labelitemiv{\textperiodcentered}
```

25.8.4 Description

`description` The description environment is defined here – while the itemize and enumerate environments are defined in `latex.dtx`.

```
\newenvironment{description}
{\list{}{\labelwidth\z@ \itemindent-\leftmargin
    \let\makelabel\descriptionlabel}}
{\endlist}
```

`\descriptionlabel` To change the formatting of the label, you must redefine `\descriptionlabel`.

```
\newcommand*\descriptionlabel[1]{\hspace\labelsep
  \normalfont\bfseries #1}
```

25.9 Defining new environments

25.9.1 Abstract

abstract

With onecolumn the abstract is treated as a chapter. With the twocolumn option, the abstract is still displayed in one column but we must format it and make sure it appears in the table of contents. The abstract also opens facing when the twoside option is chosen.

```
\newenvironment{abstract}{%
%    The page numbering should start on the abstract as page ii but
%    the abstract should open on an odd page.  Thus, if the |\twoside|
%    option is chosen (which is not allowed by the library) then we
%    will forgo this rule and leave the counter as it is.  We should
%    turn pagenumbering and headings on now, but the user will be
%    responsible for this.   If he/she follows the instructions in the
%    sample file, this will happen automatically because the page numbers
%    have been suppressed on the other pages.
%    \begin{macrocode}
  \if@twoside\else
    \setcounter{page}{2}
  \fi
```

Here we set the page to one column and reset the margins if needed.

```
  \if@twocolumn\@startonecolumn\fi
```

Now we format the abstract as a chapter.

```
    \chaptertoc{\abstractname}{\abstractname}
%    \addcontentsline{toc}{chapter}{\abstractname}%
%    \@mkboth{\abstractname}{\abstractname}%
%    \@aligntitle{{\abstractfont \abstractname}}
%    \@endparpenalty\@M
}
```

Here is the end of the environment. We clear the page and reset the column spacing.

```
{\clearpage\@endonecolumn}
% \end{environment}
%
% \begin{environment}
% \subsubsection{Verse}
%
% \begin{environment}{verse}
%   The verse environment is defined by making clever use of the
%   list environment's parameters.  The user types |\\| to end a line.
%   This is implemented by |\let|'ing |\\| equal |\@centercr|.
%
% \changes{v1.3j}{1995/08/16}{stop \cs{item} scanning for [ with
%    \cs{relax}}
%    \begin{macrocode}
\newenvironment{verse}
               {\let\\\@centercr
                \list{}{\itemsep      \z@
                        \itemindent   -1.5em%
                        \listparindent\itemindent
                        \rightmargin  \leftmargin
```

```
                              \advance\leftmargin 1.5em}%
                   \item\relax}
                  {\endlist}
```

25.9.2 Quotation

`quotation` The quotation environment is also defined by making clever use of the list environment's parameters. The lines in the environment are set smaller than `\textwidth`. The first line of a paragraph inside this environment is indented.

```
\newenvironment{quotation}
                  {\list{}{\listparindent 1.5em%
                              \itemindent    \listparindent
                              \rightmargin   \leftmargin
                              \parsep        \z@ \@plus\p@}%
                   \item\relax}
                  {\endlist}
```

25.9.3 Quote

`quote` The quote environment is like the quotation environment except that paragraphs are not indented.

```
\newenvironment{quote}
                  {\list{}{\rightmargin\leftmargin}%
                   \item\relax}
                  {\endlist}
```

25.9.4 Theorem

This document class does not define it's own theorem environments, the defaults, supplied by `latex.dtx` are available.

25.9.5 Appendix

`\appendix` The `\appendix` command is not really an environment, it is a macro that makes some changes in the way things are done.

In the report and book document classes the `\appendix` command must do the following:

- reset the chapter and section counters to zero,
- set `\@chapapp` to `\appendixname` (for messages),
- redefine the chapter counter to produce appendix numbers,
- possibly redefine the `\chapter` command if appendix titles and headings are to look different from chapter titles and headings. This redefinition is done globally to ensure that it survives even if `\appendix` is issued within an environment such as `multicols`.

```
\newcommand\appendix{\par
  \setcounter{chapter}{0}%
  \setcounter{section}{0}%
  \gdef\@chapapp{\appendixname}%
  \gdef\thechapter{\@Alph\c@chapter}}
```

25.10 Setting parameters for existing environments

25.10.1 Array and tabular

`\arraycolsep` The columns in an array environment are separated by 2`\arraycolsep`.

```
\setlength\arraycolsep{5\p@}
```

`\tabcolsep` The columns in an tabular environment are separated by 2`\tabcolsep`.

```
\setlength\tabcolsep{6\p@}
```

`\arrayrulewidth` The width of rules in the array and tabular environments is given by `\arrayrulewidth`.

```
\setlength\arrayrulewidth{.4\p@}
```

`\doublerulesep` The space between adjacent rules in the array and tabular environments is given by `\doublerulesep`.

```
\setlength\doublerulesep{2\p@}
```

25.10.2 Tabbing

`\tabbingsep` This controls the space that the `\'` command puts in. (See LaTeX manual for an explanation.)

```
\setlength\tabbingsep{\labelsep}
```

25.10.3 Minipage

`\@minipagerestore` The macro `\@minipagerestore` is called upon entry to a minipage environment to set up things that are to be handled differently inside a minipage environment. In the current styles, it does nothing.

`\@mpfootins` Minipages have their own footnotes; `\skip\@mpfootins` plays same rôle for footnotes in a minipage as `\skip\footins` does for ordinary footnotes.

```
\skip\@mpfootins = \skip\footins
```

25.10.4 Framed boxes

`\fboxsep` The space left by `\fbox` and `\framebox` between the box and the text in it.

`\fboxrule` The width of the rules in the box made by `\fbox` and `\framebox`.

```
\setlength\fboxsep{3\p@}
\setlength\fboxrule{.4\p@}
```

25.10.5 Equation and eqnarray

`\theequation` When within chapters, the equation counter will be reset at the beginning of a new chapter and the equation number will be prefixed by the chapter number.

This code must follow the `\chapter` definition or, more exactly, the definition of the chapter counter.

```
\@addtoreset {equation}{chapter}
\renewcommand\theequation
  {\ifnum \c@chapter>\z@ \thechapter.\fi \@arabic\c@equation}
```

\jot `\jot` is the extra space added between lines of an eqnarray environment. The default value is used.

```
% \setlength\jot{3pt}
```

\@eqnnum The macro `\@eqnnum` defines how equation numbers are to appear in equations. Again the default is used.

```
% \def\@eqnnum{(\theequation)}
```

25.11 Floating objects

The file `latex.dtx` only defines a number of tools with which floating objects can be defined. This is done in the document class. It needs to define the following macros for each floating object of type `TYPE` (e.g., `TYPE` = figure).

`\fps@TYPE` The default placement specifier for floats of type `TYPE`.

`\ftype@TYPE` The type number for floats of type `TYPE`. Each `TYPE` has associated a unique positive `TYPE` number, which is a power of two. E.g., figures might have type number 1, tables type number 2, programs type number 4, etc.

`\ext@TYPE` The file extension indicating the file on which the contents list for float type `TYPE` is stored. For example, `\ext@figure` = 'lof'.

`\fnum@TYPE` A macro to generate the figure number for a caption. For example, `\fnum@TYPE` == 'Figure `\thefigure`'.

`\@makecaption`⟨***num***⟩⟨***text***⟩ A macro to make a caption, with ⟨*num*⟩ the value produced by `\fnum@...` and ⟨*text*⟩ the text of the caption. It can assume it's in a `\parbox` of the appropriate width. This will be used for *all* floating objects.

The actual environment that implements a floating object such as a figure is defined using the macros `\@float` and `\end@float`, which are defined in `latex.dtx`.

An environment that implements a single column floating object is started with `\@float{TYPE}[`⟨*placement*⟩`]` of type `TYPE` with ⟨*placement*⟩ as the placement specifier. The default value of ⟨*PLACEMENT*⟩ is defined by `\fps@TYPE`.

The environment is ended by `\end@float`. E.g., `\figure` == `\@float`figure, `\endfigure` == `\end@float`.

25.11.1 Figure

Here is the implementation of the figure environment.

\c@figure First we have to allocate a counter to number the figures.

In the report and book document classes figures within chapters are numbered per chapter.

```
\newcounter{figure}[chapter]
\renewcommand \thefigure
     {\ifnum \c@chapter>\z@ \thechapter.\fi \@arabic\c@figure}
```

`\fps@figure` `\ftype@figure` `\ext@figure` `\num@figure` Here are the parameters for the floating objects of type ‘figure’.

```
\def\fps@figure{tbp}
\def\ftype@figure{1}
\def\ext@figure{lof}
\def\fnum@figure{\figurename\nobreakspace\thefigure}
```

`figure` `figure*` And the definition of the actual environment. The form with the `*` is used for double column figures.

```
\newenvironment{figure}
               {\@float{figure}}
               {\end@float}
\newenvironment{figure*}
               {\@dblfloat{figure}}
               {\end@dblfloat}
```

25.11.2 Table

Here is the implementation of the table environment. It is very much the same as the figure environment.

`\c@table` First we have to allocate a counter to number the tables.

In the report and book document classes tables within chapters are numbered per chapter.

```
\newcounter{table}[chapter]
\renewcommand \thetable
     {\ifnum \c@chapter>\z@ \thechapter.\fi \@arabic\c@table}
```

`\fps@table` `\ftype@table` `\ext@table` `\num@table` Here are the parameters for the floating objects of type ‘table’.

```
\def\fps@table{tbp}
\def\ftype@table{2}
\def\ext@table{lot}
\def\fnum@table{\tablename\nobreakspace\thetable}
```

`table` `table*` And the definition of the actual environment. The form with the `*` is used for double column tables.

```
\newenvironment{table}
               {\@float{table}}
               {\end@float}
\newenvironment{table*}
               {\@dblfloat{table}}
               {\end@dblfloat}
```

25.11.3 Captions

`\@makecaption` The `\caption` command calls `\@makecaption` to format the caption of floating objects. It gets two arguments, ⟨*number*⟩, the number of the floating object and ⟨*text*⟩, the text of the caption. Usually ⟨*number*⟩ contains a string such as ‘Figure 3.2’. The macro can assume it is called inside a `\parbox` of right width, with `\normalsize`.

`\abovecaptionskip` `\belowcaptionskip` These lengths contain the amount of white space to leave above and below the caption.

```
\newlength\abovecaptionskip
\newlength\belowcaptionskip
\setlength\abovecaptionskip{10\p@}
\setlength\belowcaptionskip{0\p@}
```

The definition of this macro is `\long` in order to allow more then one paragraph in a caption.

```
\long\def\@makecaption#1#2{%
  \vskip\abovecaptionskip
```

We want to see if the caption fits on one line on the page, therefore we first typeset it in a temporary box.

```
  \sbox\@tempboxa{{\captionheaderfont #1:} {\captionbodyfont #2}}%
```

We can the measure its width. If it it is larger than the current `\hsize` we typeset the caption as an ordinary paragraph. In this case, we check the option hangingcaptions to see if we should hang the caption after the label or not.

```
  \ifdim \wd\@tempboxa >\hsize
  \if@hangingcaptions
    \@hangfrom{\captionheaderfont #1: }{\captionbodyfont #2\par}%
  \else
    #1: #2\par%
  \fi
```

If the caption fits, we center it. Because this uses an `\hbox` directly in vertical mode, it does not execute the `\everypar` tokens; the only thing that could be needed here is resetting the 'minipage flag' so we do this explicitly.

```
  \else
    \global \@minipagefalse
    \hb@xt@\hsize{\hfil\box\@tempboxa\hfil}%
  \fi
  \vskip\belowcaptionskip}
```

25.12 Font changing

Here we supply the declarative font changing commands that were common in LaTeX version 2.09 and earlier. These commands work in text mode *and* in math mode. They are provided for compatibility, but one should start using the `\text...` and `\math...` commands instead. These commands are defined using `\DeclareTextFontCommand`, a command with three arguments: the user command to be defined; LaTeX commands to execute in text mode and LaTeX commands to execute in math mode.

`\rm` `\tt` `\sf` The commands to change the family. When in compatibility mode we select the 'default' font first, to get LaTeX2.09 behaviour.

```
\DeclareOldFontCommand{\rm}{\normalfont\rmfamily}{\mathrm}
\DeclareOldFontCommand{\sf}{\normalfont\sffamily}{\mathsf}
\DeclareOldFontCommand{\tt}{\normalfont\ttfamily}{\mathtt}
```

`\bf` The command to change to the bold series. One should use `\mdseries` to explicitly switch back to medium series.

```
\DeclareOldFontCommand{\bf}{\normalfont\bfseries}{\mathbf}
```

\sl \it \sc

And the commands to change the shape of the font. The slanted and small caps shapes are not available by default as math alphabets, so those changes do nothing in math mode. However, we do warn the user that the selection will not have any effect.One should use `\upshape` to explicitly change back to the upright shape.

```
\DeclareOldFontCommand{\it}{\normalfont\itshape}{\mathit}
\DeclareOldFontCommand{\sl}{\normalfont\slshape}{\@nomath\sl}
\DeclareOldFontCommand{\sc}{\normalfont\scshape}{\@nomath\sc}
```

\cal \mit

The commands `\cal` and `\mit` should only be used in math mode, outside math mode they have no effect. Currently the New Font Selection Scheme defines these commands to generate warning messages. Therefore we have to define them 'by hand'.

```
\DeclareRobustCommand*\cal{\@fontswitch\relax\mathcal}
\DeclareRobustCommand*\mit{\@fontswitch\relax\mathnormal}
```

26 Cross Referencing

26.1 Table of Contents, etc.

A `\section` command writes a `\contentsline{section}{`⟨*title*⟩`}{`⟨*page*⟩`}` command on the `.toc` file, where ⟨*title*⟩ contains the contents of the entry and ⟨*page*⟩ is the page number. If sections are being numbered, then ⟨*title*⟩ will be of the form `\numberline{`⟨*num*⟩`}{`⟨*heading*⟩`}` where ⟨*num*⟩ is the number produced by `\thesection`. Other sectioning commands work similarly.

A `\caption` command in a 'figure' environment writes
`\contentsline{figure}{\numberline{`⟨*num*⟩`}{ `⟨*caption*⟩`}}{`⟨*page*⟩`}`
on the `.lof` file, where ⟨*num*⟩ is the number produced by `\thefigure` and ⟨*caption*⟩ is the figure caption. It works similarly for a 'table' environment.

The command `\contentsline{`⟨*name*⟩`}` expands to `\l@`⟨*name*⟩. So, to specify the table of contents, we must define `\l@chapter`, `\l@section`, `\l@subsection`, ... ; to specify the list of figures, we must define `\l@figure`; and so on. Most of these can be defined with the `\@dottedtocline` command, which works as follows.
`\@dottedtocline{`⟨*level*⟩`}{`⟨*indent*⟩`}{`⟨*numwidth*⟩`}{`⟨*title*⟩`}{`⟨*page*⟩`}`

⟨*level*⟩ An entry is produced only if⟨ *level*⟩ <= value of the *tocdepth* counter. Note, `\chapter` is level 0, `\section` is level 1, etc.

⟨*indent*⟩ The indentation from the outer left margin of the start of the contents line.

⟨*numwidth*⟩ The width of a box in which the section number is to go, if ⟨*title*⟩ includes a `\numberline` command.

\@pnumwidth \@tocrmarg \@dotsep

This command uses the following three parameters, which are set with a `\newcommand` (so em's can be used to make them depend upon the font).

`\@pnumwidth` The width of a box in which the page number is put.

`\@tocrmarg` The right margin for multiple line entries. One wants `\@tocrmarg` ≥ `\@pnumwidth`

\@dotsep Separation between dots, in mu units. Should be defined as a number like 2 or 1.7

```
\newcommand\@pnumwidth{1.55em}
\newcommand\@tocrmarg{2.55em}
\newcommand\@dotsep{4.5}
\setcounter{tocdepth}{2}
```

26.1.1 Table of Contents

\tableofcontents This macro is used to request that LaTeX produces a table of contents. In the report and book document classes the tables of contents, figures etc. are always set in single-column style.

```
\newcommand\tableofcontents{%
  \cleardoublepage
    \if@twocolumn
      \@restonecoltrue\onecolumn
    \else
      \@restonecolfalse
    \fi
```

The title is set using the \chaptertoc command, making sure that the running head –if one is required– contains the right information. Note that this includes the table of contents in the table of contents.

```
    \chaptertoc{\contentsname}{\contentsname}
```

The the actual table of contents is made by calling \@starttoc{toc}. After that we restore twocolumn mode if necessary.

```
    \@starttoc{toc}%
    \if@restonecol\twocolumn\fi
    }
```

\l@part Each sectioning command needs an additional macro to format its entry in the table of contents, as described above. The macro for the entry for parts is defined in a special way.

First we make sure that if a page break should occur, it occurs *before* this entry. Also a little whitespace is added and a group begun to keep changes local.

```
\newcommand*\l@part[2]{%
  \ifnum \c@tocdepth >-2\relax
    \addpenalty{-\@highpenalty}%
    \addvspace{2.25em \@plus\p@}%
```

The macro \numberline requires that the width of the box that holds the part number is stored in LaTeX's scratch register \@tempdima. Therefore we initialize it there even though we do not use \numberline internally—the value used is quite large so that something like \numberline{VIII} would still work.

```
    \setlength\@tempdima{3em}%
    \begingroup
```

We set \parindent to 0pt and use \rightskip to leave enough room for the page numbers.[2] To prevent overfull box messages the `\parfillskip` is set to a negative value.

```
      \parindent \z@ \rightskip \@pnumwidth
      \parfillskip -\@pnumwidth
```

Now we can set the entry, in a large bold font. We make sure to leave vertical mode, set the part title and add the pagenumber, set flush right.

```
      {\leavevmode
       \large \bfseries #1\hfil \hb@xt@\@pnumwidth{\hss #2}}\par
```

Prevent a page break immediately after this entry, but use `\everypar` to reset the `\if@nobreak` switch. Finally we close the group.

```
       \nobreak
         \global\@nobreaktrue
         \everypar{\global\@nobreakfalse\everypar{}}%
    \endgroup
  \fi}
```

`\l@chapter` This macro formats the entries in the table of contents for chapters. It is very similar to `\l@part`

First we make sure that if a page break should occur, it occurs *before* this entry. Also a little whitespace is added and a group begun to keep changes local.

```
\newcommand*\l@chapter[2]{%
  \ifnum \c@tocdepth >\m@ne
    \addpenalty{-\@highpenalty}%
    \vskip 1.0em \@plus\p@
```

The macro `\numberline` requires that the width of the box that holds the part number is stored in LaTeX's scratch register `\@tempdima`. Therefore we initialize it there even though we do not use `\numberline` internally (the position as well as the values seems questionable but can't be changed without producing compatibility problems). We begin a group, and change some of the paragraph parameters (see also the remark at `\l@part` regarding `\rightskip`).

```
    \setlength\@tempdima{1.5em}%
    \begingroup
      \parindent \z@ \rightskip \@pnumwidth
      \parfillskip -\@pnumwidth
```

Then we leave vertical mode.

```
      \leavevmode
```

Because we do not use `\numberline` here, we have do some fine tuning 'by hand', before we can set the entry. We discourage but not disallow a page break immediately after a chapter entry.

```
      \advance\leftskip\@tempdima
      \hskip -\leftskip
      {\bfseries #1}\nobreak%
```

[2]We should really set `\rightskip` to `\@tocrmarg` instead of `\@pnumwidth` (no version of LaTeX ever did this), otherwise the `\rightskip` is too small. Unfortunately this can't be changed in LaTeX 2_ε as we don't want to create different versions of LaTeX 2_ε which produce different typeset output unless this is absolutely necessary; instead we suspend it for LaTeX3.

Dotted leaders can be controlled by setting the boolean `\if@chaptertocdotstrue`.

```
      \if@chaptertocdots
        \leaders\hbox{$\m@th%
```

If a document uses fonts other than computer modern, the use of a dot from math can be very disturbing despite the fact that this might be the only place in a document that then uses computer modern. Therefore we surround the dot with an `\hbox` to escape to the surrounding text font.

```
          \mkern \@dotsep mu\hbox{.}\mkern \@dotsep%
          mu$}\hfil
      \else
        \hfil
      \fi
%      \nobreak\hb@xt@\@pnumwidth{\hss #2}\par
      \hb@xt@\@pnumwidth{\hfil\normalfont \normalcolor #2}\par%
      \penalty\@highpenalty
    \endgroup
  \fi}
```

`\l@section` The definition for `\l@section` is much simpler.

```
\newcommand*\l@section[2]{%
  \@dottedtocline{1}{1.5em}{2.3em}{#1}{#2}%
}
```

`\l@subsection` `\l@subsubsection` `\l@paragraph` `\l@subparagraph` All lower level entries are defined using the macro `\@dottedtocline` (see above).

```
\newcommand*\l@subsection[2]{\@dottedtocline{2}{3.8em}{3.2em}{#1}{#2}}
\newcommand*\l@subsubsection[2]{\@dottedtocline{3}{7.0em}{4.1em}{#1}{#2}}
\newcommand*\l@paragraph[2]{\@dottedtocline{4}{10em}{5em}{#1}{#2}}
\newcommand*\l@subparagraph[2]{\@dottedtocline{5}{12em}{6em}{#1}{#2}}
```

26.1.2 List of figures

`\listoffigures` This macro is used to request that LaTeX produces a list of figures. It is very similar to `\tableofcontents`.

```
\newcommand\listoffigures{%
    \if@twocolumn
      \@restonecoltrue\onecolumn
    \else
      \@restonecolfalse
    \fi
    \chaptertoc{\listfigurename}{\listfigurename}%
    \@starttoc{lof}%
    \if@restonecol\twocolumn\fi
    }
```

`\l@figure` This macro produces an entry in the list of figures.

```
\newcommand*\l@figure{\@dottedtocline{1}{\lofindent}{\loflabelwidth}}
```

26.1.3 List of tables

\listoftables This macro is used to request that LaTeX produces a list of tables. It is very similar to \tableofcontents.

```
\newcommand\listoftables{%
    \if@twocolumn
      \@restonecoltrue\onecolumn
    \else
      \@restonecolfalse
    \fi
    \chaptertoc{\listtablename}{\listtablename}%
    \@starttoc{lot}%
    \if@restonecol\twocolumn\fi
    }
```

\l@table This macro produces an entry in the list of tables.

```
%\let\l@table\l@figure
\newcommand*\l@table{\@dottedtocline{1}{\lotindent}{\lotlabelwidth}}
```

26.2 Bibliography

The bibliography commands should be defined at the end of the preamble so that they supersede any redefinitions that may occur in an optional package such as natbib. First we define a dummy environment so that natbib does not complain when it redefines it:

```
\newenvironment{thebibliography}[1]{}{}
```

Now put our definition at the end of the preamble:

```
\AtBeginDocument{
```

\bibindent The "open" bibliography format uses an indentation of \bibindent.

```
\newdimen\bibindent
\setlength\bibindent{1.5em}
```

thebibliography The 'thebibliography' environment executes the following commands:

\renewcommand{\newblock}{\hskip.11em \@plus.33em \@minus.07em} — Defines the "closed" format, where the blocks (major units of information) of an entry run together.

\sloppy — Used because it's rather hard to do line breaks in bibliographies,

\sfcode`\.=1000\relax — Causes a '.' (period) not to produce an end-of-sentence space.

The implementation of this environment is based on the generic list environment. It uses the *enumiv* counter internally to generate the labels of the list.

When an empty 'thebibliography' environment is found, a warning is issued.

```
\renewenvironment{thebibliography}[1]
{
  \chaptertoc{\bibname}{\bibname}%
  \list{\@biblabel{\@arabic\c@enumiv}}%
  {\settowidth\labelwidth{\@biblabel{#1}}%
    \leftmargin\labelwidth
    \advance\leftmargin\labelsep
```

```
    \@openbib@code
    \usecounter{enumiv}%
    \let\p@enumiv\@empty
    \renewcommand\theenumiv{\@arabic\c@enumiv}}%
  \sloppy
```

This is setting the normal (non-infinite) value of `\clubpenalty` for the whole of this environment, so we must reset its stored value also. (Why is there a `%` after the second 4000 below?)

```
  \clubpenalty4000
  \@clubpenalty \clubpenalty
  \widowpenalty4000%
  \sfcode`\.\@m}
{\def\@noitemerr
  {\@latex@warning{Empty `thebibliography' environment}}%
  \endlist}
```

`\newblock` The default definition for `\newblock` is to produce a small space.

```
\newcommand\newblock{\hskip .11em\@plus.33em\@minus.07em}
```

`\@openbib@code` The default definition for `\@openbib@code` is to do nothing. It will be changed by the openbib option.

```
\let\@openbib@code\@empty
```

`\@biblabel` The label for a `\bibitem[...]` command is produced by this macro. The default from `latex.dtx` is used.

```
% \renewcommand*{\@biblabel}[1]{[#1]\hfil}
```

`\@cite` The output of the `\cite` command is produced by this macro. The default from `latex.dtx` is used.

```
% \renewcommand*{\@cite}[1]{[#1]}
```

This now closes the group of commands defined at the end of the preamble.

```
} % AtBeginDocument
```

26.3 The index

`theindex` The environment 'theindex' can be used for indices. It makes an index with two columns, with each entry a separate paragraph. At the user level the commands `\item`, `\subitem` and `\subsubitem` are used to produce index entries of various levels. When a new letter of the alphabet is encountered an amount of `\indexspace` white space can be added.

```
\newenvironment{theindex}
               {\if@twocolumn
                  \@restonecolfalse
                \else
                  \@restonecoltrue
                \fi
                \columnseprule \z@
                \columnsep 35\p@
                \twocolumn[\@makeschapterhead{\indexname}]%
                \@mkboth{\@toupper{\indexname}}{\@toupper{\indexname}}%
```

```
                  \thispagestyle{plain}\parindent\z@
                  \parskip\z@ \@plus .3\p@\relax
                  \let\item\@idxitem}
```

When the document continues after the index and it was a one column document we have to switch back to one column after the index.

```
                 {\if@restonecol\onecolumn\else\clearpage\fi}
```

\@idxitem \subitem \subsubitem These macros are used to format the entries in the index.

```
\newcommand\@idxitem{\par\hangindent 40\p@}
\newcommand\subitem{\@idxitem \hspace*{20\p@}}
\newcommand\subsubitem{\@idxitem \hspace*{30\p@}}
```

\indexspace The amount of white space that is inserted between 'letter blocks' in the index.

```
\newcommand\indexspace{\par \vskip 10\p@ \@plus5\p@ \@minus3\p@\relax}
```

26.4 Footnotes

\footnoterule Usually, footnotes are separated from the main body of the text by a small rule. This rule is drawn by the macro `\footnoterule`. We have to make sure that the rule takes no vertical space (see `plain.tex`) so we compensate for the natural height of the rule of 0.4pt by adding the right amount of vertical skip.

To prevent the rule from colliding with the footnote we first add a little negative vertical skip, then we put the rule and make sure we end up at the same point where we begun this operation.

```
\renewcommand\footnoterule{%
  \kern-3\p@
  \hrule\@width.4\columnwidth
  \kern2.6\p@}
```

\c@footnote Footnotes are numbered within chapters in the report and book document styles.

```
\@addtoreset{footnote}{chapter}
```

\@makefntext The footnote mechanism of LaTeX calls the macro `\@makefntext` to produce the actual footnote. The macro gets the text of the footnote as its argument and should use `\@thefnmark` as the mark of the footnote. The macro `\@makefntext`is called when effectively inside a `\parbox` of width `\columnwidth` (i.e., with `\hsize` = `\columnwidth`).

An example of what can be achieved is given by the following piece of TeX code.

```
\newcommand\@makefntext[1]{%
   \@setpar{\@@par
            \@tempdima = \hsize
            \advance\@tempdima-10pt
            \parshape \@ne 10pt \@tempdima}%
   \par
   \parindent 1em\noindent
   \hbox to \z@{\hss\@makefnmark}#1}
```

The effect of this definition is that all lines of the footnote are indented by 10pt, while the first line of a new paragraph is indented by 1em. To change these dimensions, just substitute the desired value for '10pt' (in both places) or '1em'. The mark is flushright against the footnote.

In these document classes we use a simpler macro, in which the footnote text is set like an ordinary text paragraph, with no indentation except on the first line of a paragraph, and the first line of the footnote. Thus, all the macro must do is set `\parindent` to the appropriate value for succeeding paragraphs and put the proper indentation before the mark.

```
\newcommand\@makefntext[1]{%
    \parindent 1em%
    \noindent
    \hb@xt@1.8em{\hss\@makefnmark}#1}
```

`\@makefnmark` The footnote markers that are printed in the text to point to the footnotes should be produced by the macro `\@makefnmark`. We use the default definition for it.

```
%\renewcommand\@makefnmark{\hbox{\@textsuperscript
%                                 {\normalfont\@thefnmark}}}
```

27 Initialization

27.1 Words

This document class is for documents prepared in the English language. To prepare a version for another language, various English words must be replaced. All the English words that require replacement are defined below in command names. These commands may be redefined in any class or package that is customising LaTeX for use with non-English languages. These are not meant to be used by the user unless they really need access to change these, thus I have kept them in the same syntax as for the `book` class.

`\contentsname` `\listfigurename` `\listtablename`

```
\newcommand\contentsname{Contents}
\newcommand\listfigurename{List of Figures}
\newcommand\listtablename{List of Tables}
```

`\bibname` `\indexname`

```
\newcommand\bibname{Bibliography}
\newcommand\indexname{Index}
```

`\figurename` `\tablename`

```
\newcommand\figurename{Figure}
\newcommand\tablename{Table}
```

`\partname` `\chaptername` `\appendixname` `\abstractname` `\prefacename` `\forewordname` `\acknowledgementsname`

```
\newcommand\partname{Part}
\newcommand\chaptername{Chapter}
\newcommand\appendixname{Appendix}
\newcommand\abstractname{Abstract}
\newcommand\prefacename{Preface}
```

```
\newcommand\forewordname{Foreword}
\newcommand\acknowledgementsname{Acknowledgements}
```

\forewordname

```
\newcommand\draftname{Preliminary Draft}
```

27.2 Date

\today This macro uses the TeX primitives `\month`, `\day` and `\year` to provide the date of the LaTeX-run.

At `\begin{document}` this definition will be optimized so that the names of all the 'wrong' months are not stored. This optimisation is not done here as that would 'freeze' `\today` in any special purpose format made by loading the class file into the format file.

```
\def\today{\ifcase\month\or
  January\or February\or March\or April\or May\or June\or
  July\or August\or September\or October\or November\or December\fi
  \space\number\day, \number\year}
```

27.3 Two column mode

\columnsep This gives the distance between two columns in two column mode.

```
\setlength\columnsep{10\p@}
```

\columnseprule This gives the width of the rule between two columns in two column mode. We have no visible rule.

```
\setlength\columnseprule{0\p@}
```

27.4 The page style

We use the page style *headings* by default. We use Arabic page numbers.

```
\if@final
  \if@runningheaders
    \pagestyle{headings}
  \else
    \pagestyle{plain}
  \fi
\else
  \pagestyle{draft}
\fi
\pagenumbering{arabic}
```

27.5 Single or double sided printing

When the twoside option wasn't specified, we don't try to make each page as long as all the others.

```
\if@twoside
\else
  \raggedbottom
\fi
```

When the twocolumn option was specified we call \twocolumn to activate this mode. We try to make each column as long as the others, but call sloppy to make our life easier.

```
\if@twocolumn
  \twocolumn
  \sloppy
  \flushbottom
```

Normally we call \onecolumn to initiate typesetting in one column.

```
\else
  \onecolumn
\fi
```

27.6 Single or double spacing

\committeespacing

The spacing of the document is single spaced by default unless the committee option is selected. In this case it is set by \commiteespacing which is by default 1.5 spaced so that the thesis committee has room for comments.

```
\newcommand{\committeespacing}{1.5}
\AtBeginDocument{
  \renewcommand\baselinestretch{%
    \if@committee%
      \committeespacing%
    \else 1%
    \fi%
  }%
}%
```

Finally, we close off the file so that nothing else is put into the sample thesis.

```
⟨/ubcthesis⟩
```

Index

Numbers written in italic refer to the page where the corresponding entry is described; numbers underlined refer to the code line of the definition; numbers in roman refer to the code lines where the entry is used.

A

B

C

Change History