Writing Your Thesis

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1 The `baththesis` Package

The `baththesis` package is used to generate a thesis layout that complies with the University of Bath's regulations concerning page layout when submitting for a higher degree by research. It is designed to be used with the `report` class. Thus it is loaded by
`\documentclass{report}`
`\usepackage{baththesis}`
Things are already set up for A4 paper so there is no need to set the paper size. You can set the point size but bear in mind that the University regulations only allow a font size of

11 or 12 points. The `baththesis` package also sets up the margins and page numbering for you. Only single and one-and-a-half line-spacing are permitted. The default line-spacing in the `baththesis` package is one-and-a-half line-spacing. If you want to decrease the line-spacing to single-spacing, put the command `\singlespacing` in the preamble.

1.1 The Title Page

There are detailed regulations concerning the title page but these are taken care of by `\maketitle`. You simply need to provide some information. In the preamble type the appropriate variation of the following:

```
\degree{Doctor of Philosophy}
\author{Petra Jane Harwin}
\title{Asymptotic Pattern Formation in Second
 and Higher Order Quasilinear Parabolic Equations}
\department{Department of Mathematical Sciences}
\degreemonthyear{December 2004}
```

1.1.1 Restrictions on Use

The regulations demand that a certificate appear at the bottom of the title page describing any restrictions on the availability of the thesis to other libraries. If there are no restrictions put `\norestrictions` in the preamble. If you do require a restriction on the circulation of the thesis then put the line `\restrictions{number}` in the preamble. Here the argument `number` is the number (in words) of years that the restriction is to be in force. Usually, the maximum is three. Now just type `\maketitle` just after `\begin{document}` to create your title page.

1.2 The Abstract

The regulations specify that the thesis must include a bound-in summary of the work, not exceeding three hundred words in length. This can be achieved by using the `abstract` environment. Its syntax is very easy:

```
\begin{abstract}
The text of the abstract goes here.
\end{abstract}
```

1.3 Adding Appendices

To add appendices to your document use the declaration `\appendix` just before you wish the appendices to start and then continue to use LaTeX as normal. Now each time

you invoke the highest level sectioning command LaTeX produces a letter (rather than a number) and the appropriate heading.

Any computing code used during the thesis may be put into an appendix using the `verbatim` environment:

```
\begin{verbatim}
The code goes here...
\end{verbatim}
```

This environment will produce exactly what you have typed so be careful to check for bad boxes as no newlines are generated automatically.

1.4 Adding a Table of Contents

A table of contents is mandatory and can be added easily by using the command `\tableofcontents` at the point in the document where you wish the table of contents to appear. However, an entry in the table of contents will not be made automatically for things like the bibliography. To add an entry to the table of contents add the line

```
\addcontentsline{toc}{entry type}{title}
```

just before the object to be included. Here `toc` tells LaTeX to add a contents line to the table of contents; `entry type` is the type of entry style you want (chapter, section, subsection etc.), and `title` is the title of what you want to list in the table of contents. Therefore to include an entry in the table of contents for the bibliography chapter in my thesis I would type

```
\addcontentsline{toc}{chapter}{Bibliography}
```

just before my bibliography started.

1.5 List of Figures or Tables

A list of figures or tables may be produced using the following commands

```
\listoffigures
\listoftables
```

Figures or tables that do not have a caption will not appear in this list. Thus, if you want them to appear, you must add an entry to the appropriate list:

```
\addcontentsline{lof}{figure}{Figure name}
\addcontentsline{lot}{table}{Table name}
```

Where `Figure name` and `Table name` should be what you want to appear in the list of figures and list of tables respectively.

2 Adding Theorems and Definitions

The easiest way to add theorems and definitions to any LaTeX document is to use the `amsthm` package. To use this package type `\usepackage{amsthm}` in the preamble followed

by the declaration

```
\theoremstyle{style}
```

where style is one of the following.

`plain` Italic body text. Use this environment for theorems.

`definition` Roman body text. Use this environment for definitions.

`remark` Roman body text with an italic header.

Directly after this declaration you should define your theorem environments via one of the following two commands:

```
\newtheorem{name}[use-counter]{heading}
\newtheorem{name}{heading}[number-within]
```

where

`name` is the name you would like for the environment.

`heading` is the heading you would like displayed when you use the environment.

`use-counter` specifies which counter the environment should use.

`number-within` specifies a parent counter.

2.1 Examples

```
\usepackage{amsthm}
\theoremstyle{plain}
\newtheorem{theorem}{Theorem}
\newtheorem{lemma}{Lemma}
```

typed in the preamble with

```
\section{Section}
\begin{theorem}My first theorem...\end{theorem}
\begin{lemma}My first Lemma...\end{lemma}
```

typed in the body produces

1 Section

Theorem 1. *My first theorem...*

Lemma 1. *My first lemma...*

To number these within the section change the text in the preamble to

```
\newtheorem{theorem}{Theorem}[section]
\newtheorem{lemma}{Lemma}[section]
```

This produces

1 Section

Theorem 1.1. *My first theorem...*

Lemma 1.1. *My first lemma...*

To number theorems and lemmas sequentially and within the section, change the text in the preamble to

```
\newtheorem{theorem}{Theorem}[section]
\newtheorem{lemma}[theorem]{Lemma}
```

This produces

1 Section

Theorem 1.1. *My first theorem...*

Lemma 1.2. *My first lemma...*

Since `\theoremstyle` is a declaration, to add a definition environment to our list we add to our text in the preamble as follows:

```
\theoremstyle{plain}
\newtheorem{theorem}{Theorem}[section]
\newtheorem{lemma}[theorem]{Lemma}
\theoremstyle{definition}
\newtheorem{defn}{Definition}
```

Adding a definition in our body text:

```
\begin{defn}My first {\em definition}...\end{defn}
```

yields

1 Section

Theorem 1.1. *My first theorem...*

Lemma 1.2. *My first lemma...*

Definition 1. My first *definition*...

You can customise the numbering as before.

2.2 The `proof` environment

There is also and environment for proofs included in the `amsthm` package. Typing

```
\begin{proof}
Content of proof
\end{proof}
```

Proof. Content of proof □

3 The `fancyhdr` Package

Now you have the layout of a basic thesis file you can begin to customise it. The `\fancyhdr` package allows you to customise the standard headers and footers in LaTeX. To use this package you must type
`\usepackage{fancyhdr}\pagestyle{fancy}`
in the preamble.

Its use must also be defined. It takes six basic arguments that should be type either in the preamble after `\pagestyle{fancy}` or at the point you wish the fancy headers to begin.

`\lhead{},\chead{},\rhead{}` Define the left, centre and right headers respectively.

`\lfoot{},\cfoot{},\rfoot{}` Define the left, centre and right footers respectively.

3.1 Warning

When using `fancyhdr` in conjunction with the `baththesis` package you must set `\topmargin`, `\headheight` and `\headsep` yourself since there are no headers defined in `baththesis`. If you do this, make sure that you maintain at least a 15mm margin at the top and bottom of the page! I used

```
\setlength{\topmargin}{0pt}
\setlength{\headheight}{15pt}
\setlength{\headsep}{15pt}
```

For details of what these commands do look at Chapter 4 of Mittelbach and Goossens or page 35 in Kopka and Daly.

3.2 Default Headers and Footers

If none of the arguments are specified the defaults are as follows:

Double sided printing the highest sectioning mark (number and title) appears in block capitals in slanted text on the left (right) side of odd (even) numbered pages. The next level down in sectioning appears in the same style on the opposite side of the header. The centre of the header is left blank. The only footer is the centre footer and contains the current page number.

One sided printing as above for odd numbered pages.

This isn't always what you want, so the next step is to learn how to redefine these.

3.3 Defining Headers and Footers

Fortunately, most of the things that you would want as headers and footers are kept internally by LaTeX. Here are some examples.

`\leftmark` This contains the highest sectioning mark (number and title).

`\rightmark` This contains the next sectioning level down (number and title).

`\thepage` This contains the current page number.

Thus we can get the page number at the top right and the chapter number and title at the top left in our thesis by typing
`\lhead{\leftmark}\chead{}\rhead{\thepage}`
`\lfoot{}\cfoot{}\rfoot{}`

3.4 Customisation

`fancyhdr` is fairly intelligent in that it will not produce headers and footers for title pages. If, however, you do happen to find headers on a page where they are not needed, then nullify this by typing `\thispagestyle{plain}` (if you still want the page number to appear) or `\thispagestyle{empty}` (if you want no headers or footers) at the start of the offending page.

More complex versions of the basic arguments of `fancyhdr` are needed to define different headers and footers for odd and even pages among other things. For a full discussion of these I recommend the online documentation
http://www.ctan.org/tex-archive/macros/latex/contrib/fancyhdr/fancyhdr.pdf.

3.5 Error Messages

`fancyhdr` may return a message saying that either the header or footer is not large enough. In this case you can define a new header or footer size by using the commands
`\setlength{\headheight}{height}`

and
`\setlength{\footheight}{height}`
respectively in the preamble. Here `height` must be in points.