



# **Proyecto de Investigación: Análisis, Diseño y Construcción de un Sistema Operativo desde Cero**

by

© *Magaña Osorio Jhoel Fabrizzio*

© *Colque Quispe Fidel Enrique*

© *Montalvo Solórzano Rosy Aurely*

© *Quispe Llavilla Jhon Andherson*

Trabajo de investigación de la asignatura de Sistemas Operativos

Docente: *Ugarte Rojas Hector Ugarte*

Universidad Nacional de San Antonio Abad del Cusco

Facultad de Ingeniería Eléctrica, Electrónica, Informática y Mecánica

Escuela Profesional de Ingeniería Informática y de Sistemas

*Cusco - Perú*

*2025*

# Contents

<b>List of Tables</b>	<b>iv</b>
<b>List of Figures</b>	<b>v</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Getting started . . . . .	1
1.2 Cross References . . . . .	2
1.3 Some Suggestions . . . . .	2
1.4 The <b>Makefile</b> . . . . .	3
1.5 Changing Fonts . . . . .	4
1.6 Accents and Ligatures . . . . .	4
1.7 Some Lists . . . . .	5
1.7.1 Subsection . . . . .	5
1.7.1.1 Subsubsection . . . . .	5
1.7.1.2 Subsubsection . . . . .	6
<b>2 Figures and Tables</b>	<b>7</b>
2.1 Figures . . . . .	7

2.2 Tables . . . . .	8
<b>3 Dealing with Errors</b>	<b>11</b>
<b>Bibliography</b>	<b>12</b>
<b>References</b>	<b>12</b>

# List of Tables

2.1	Fall Semester Enrollment . . . . .	9
2.2	Masters Degrees Conferred by Convocation Session — 1950 to 2009 .	10

# List of Figures

2.1 Hello World . . . . . 8

# Chapter 1

## Introduction

### 1.1 Getting started

This is the introductory chapter. This will give you some ideas on how to use  $\text{\LaTeX}$  to typeset your document. Here is a sample quote using the `\munquote` environment:

$\text{\LaTeX}$  is a system for typesetting documents. Its first widely available version, mysteriously numbered 2.09, appeared in 1985.  $\text{\LaTeX}$  is now extremely popular in the scientific and academic communities, and it is used extensively in industry. It has become a *lingua franca* of the scientific world; scientists send their papers electronically to colleagues around the world in the form of  $\text{\LaTeX}$  input.

The citation at the end is optional — if you don't need it, then use `\munquote` without any arguments:

*“Here is a quote that does not have an associated citation after it. You can specify the citation before or after the quote manually.”*

By default, all text is double spaced, however, quotes and footnotes must be singled

spaced.<sup>1</sup> The left margin is slightly wider than the right margin. This is to compensate for binding.

An example mathematical formulae is show in Equation 1.1.

$$\sum_{i=0}^n i^2 \tag{1.1}$$

A slightly more complicated equation is given in Equation 1.2:<sup>2</sup>

$$i\hbar \frac{\partial}{\partial t} \Psi(x, t) = -\frac{\hbar^2}{2m} \nabla^2 \Psi(x, t) + V(x) \Psi(x, t) \tag{1.2}$$

## 1.2 Cross References

In addition to using `\ref` to refer to equations, you can also use it (in conjunction with the `\label` command) to refer to sections and chapters without hard coding the numbers themselves. For example, this is Section 1.2 of Chapter 1. You can also refer to Appendix ??, Subsection 1.7.1.1 below or any other place that has a `\label`. You can also use labels to refer to a page. For example, Chapter 2 starts on page 7.

## 1.3 Some Suggestions

Here are a few recommendations:

- Before using this template, make sure you check with your supervisor.

---

<sup>1</sup>This is a single spaced footnote. SGS requires that footnotes be singled spaced and this can be done with the `\munfootnote` command.

<sup>2</sup>Equation taken from the *Schrödinger equation* entry on *Wikipedia*

- MUN’s library provides electronic access to some L<sup>A</sup>T<sub>E</sub>X related textbooks which can be read online. Use the search term `latex` (computer file) on the Library’s web page.
- If you run into a problem, Google may be a helpful resource.
- Concentrate on content, let L<sup>A</sup>T<sub>E</sub>X handle the typesetting.
- Don’t worry about warnings related to:
  - overfull `hboxes`/`boxes`
  - underfull `hboxes`/`vboxes`

These can be corrected with modest rewording of your text prior to submission of your final copy.

## 1.4 The Makefile

You can use `make` to “build” your thesis on the Linux command line<sup>3</sup> This will automatically run the `bibtex` program to create your bibliography and will also re-run `latex` as necessary to ensure that all references are resolved. A device independent file (`thesis.dvi`) will be created, by default. If you are using this template in another environment other than the Linux command line, then the **Makefile** will probably not be useful to you.

- To make a PostScript copy of your thesis, type the following at the command line:

---

<sup>3</sup>Linux is available on all machines running LabNet in *The Commons* and in other computer labs on campus.

```
make thesis.ps
```

- To generate a PDF copy of your thesis, run:

```
make thesis.pdf
```

- To generate a PDF/A-1b copy of your thesis (which should satisfy the SGS's thesis submission requirements):

```
make ethesis.pdf
```

- To remove all the files generated by `bibtex` and `latex`, use the command:

```
make clean
```

- To remove the intermediate files, but leave the PostScript and DVI/PDF files intact, use the command:

```
make neat
```

As you add or remove figures, chapters, or appendices to your thesis, make sure you keep the `Makefile` up to date, too (see the `FIGURES` and `FILES` macros in the `Makefile`).

## 1.5 Changing Fonts

## 1.6 Accents and Ligatures

Some accents: é è ô ü ç ï í ñ ā ă ǎ

Some ligatures: flæffi

## 1.7 Some Lists

Here is a nested enumeration:

1. An enumerated list of items.
  - (a) which can
    - i. to arbitrary
    - ii. levels
  - (b) nest
2. More items
3. in the top
4. level list.

Another enumeration:

1. (a) Main 1 part 1
  - (b) Main 1 part 2
2. (a) Main 2 part 1
  - (b) Main 2 part 2

### 1.7.1 Subsection

#### 1.7.1.1 Subsubsection

This section is referred to by Section 1.2.

#### 1.7.1.2 Subsubsection

<Empty subsection>

# Chapter 2

## Figures and Tables

### 2.1 Figures

We can include encapsulated PostScript™ figures (`.eps`) in the document and refer to it using a label. For example, MUN’s logo can be seen in Figure ??.

Figure ?? shows a chart of MUN’s Fall enrollment from 2005 – 2009.<sup>1</sup> The figure was created using the Calc spreadsheet application of the office suite OpenOffice.org.<sup>2</sup> This figure was reduced by 50%.

For larger figures, we can use landscape mode to rotate the page and display the figure using the `\munlepsfig` command, as shown in Figure ??. The figure will be the only thing on the page when typeset in landscape mode. Alternatively, if we just want to rotate the figure, but not the entire page, we can specify an `angle` attribute in the default argument of the `\munepsfig` command. The result is shown in Figure ??. If

---

<sup>1</sup>From *Memorial University of Newfoundland — Fact Book 2009*.

<sup>2</sup>This office suite can be downloaded at no cost from <http://openoffice.org/>. Unlike other commercial office suites, OpenOffice.org may be legally shared with colleagues and fellow students. There are versions for Linux, Microsoft Windows, Mac OS X and Solaris. Also, unlike commercial offerings, OpenOffice.org does not require activation using registration keys.

the figure is too large or if there isn't sufficient text, then the figure may appear on its own page.

Note that all three of the enrollment figures are basically the same file, but with different names — on Linux, they are symbolic links to the same file. The filenames have to be different because the reference labels need to be unique.

Figure ?? shows a Petri net created using the `xfig` program (<http://www.xfig.org/>) which has very good support for L<sup>A</sup>T<sub>E</sub>X. This figure has been reduced to 40% of its original size.

We can also create figures of text (such as short code snippets) using the `\muntxtfig` command, as show in Figure 2.1.

---

```
#include <stdio.h>

int main(int argc, char **argv)
{
    printf("Hello world!\n");
    exit(0);
}
```

---

Figure 2.1: Hello World

## 2.2 Tables

We can also create tables, as seen by Table 2.1. Note that, as required by SGS guidelines, the caption for a table appears above the table whereas figure captions appear below the figures. Tables and figures can “float” — they may not appear on the page on which they are mentioned. L<sup>A</sup>T<sub>E</sub>X tries to handle figure and table

placement intelligently, but if you have a lot of them without a reasonable amount of surrounding textual content, the figures and tables can accumulate towards the end of the chapter. Generally speaking, if there is sufficient text explaining the tables and figures or if the tables/figures are relatively small, this may not be a problem. However, if you have a lot of tables or figures, it may be a good idea to put them in an appendix and refer to them as the need arises.

Table 2.1: Fall Semester Enrollment

	Undergraduate			Graduate		
	F/T	P/T	Total	F/T	P/T	Total
2004	13,191	2,223	15,414	1,308	879	2,187
2005	13,184	2,143	15,327	1,375	920	2,295
2006	12,809	2,224	15,033	1,373	899	2,272
2007	12,634	2,155	14,789	1,403	899	2,302
2008	12,269	2,208	14,477	1,410	1,005	2,415
2009	12,382	2,323	14,705	1,567	1,106	2,673

Table 2.2 shows a different table in landscape mode.<sup>3</sup> This is useful if your table is too wide for the page. Tables are double-spaced by default. To single-space a table, change the `\baselinestretch` before beginning the table environment. Remember to restore it after the environment has ended.

---

<sup>3</sup>This data was also taken from the *Memorial University of Newfoundland — Fact Book 2009*.

Table 2.2: Masters Degrees Conferred by Convocation Session — 1950 to 2009

<table><tr><th colspan="2">2009</th><th colspan="2">2008</th><th colspan="2">2007</th><th colspan="2">2006</th><th colspan="2">2006</th><th>1950–2004</th><th>Total</th></tr><tr><th>May</th><th>Oct</th><th>May</th><th>Oct</th><th>May</th><th>Oct</th><th>May</th><th>Oct</th><th>May</th><th>Oct</th><th>May</th><th>Oct</th><th></th></tr></table>													2009		2008		2007		2006		2006		1950–2004	Total	May	Oct	May	Oct	May	Oct	May	Oct	May	Oct	May	Oct	
2009		2008		2007		2006		2006		1950–2004	Total																										
May	Oct	May	Oct	May	Oct	May	Oct	May	Oct	May	Oct																										
Degrees																																					
Master of Applied Science	14	2	15	8	28	1	21	3	3	1	98	194																									
Master of Applied Social Psychology	1	5	2	5	1	4	0	4	0	4	28	54																									
Master of Applied Statistics	0	0	3	1	0	0	1	0	0	0	19	24																									
Master of Arts	37	49	26	43	14	42	14	56	13	44	994	1,332																									
Master of Business Administration	14	16	23	6	33	12	33	11	33	8	818	1,007																									
Master of Education	107	87	120	55	147	74	108	76	113	75	2,603	3,565																									
Master of Employment Relations	8	9	5	7	7	14	4	9	3	5	12	83																									
Master of Engineering	20	19	20	10	16	10	15	13	4	19	440	586																									
Master of Environmental Science	3	3	3	1	0	1	7	1	3	1	66	89																									
Master of Marine Studies	2	0	0	1	0	2	2	2	1	2	26	38																									
Master of Music	4	1	5	0	3	0	3	0	3	0	7	26																									
Master of Nursing	7	8	10	4	17	4	23	7	6	1	116	203																									
Master of Oil and Gas Studies	0	0	2	0	0	0	0	2	4	0	0	8																									
Master of Philosophy	5	4	2	1	5	2	5	3	2	0	112	141																									
Master of Physical Education	0	2	3	0	5	4	3	0	4	4	84	109																									
Master of Public Health	0	8	0	0	0	0	0	0	0	0	0	8																									
Master of Science	40	32	41	19	29	25	35	29	32	23	1,653	1,958																									
Master of Science (Kinesiology)	1	0	4	2	1	2	2	6	4	3	0	25																									
Master of Science (Medicine)	18	7	11	8	10	5	9	9	8	4	0	89																									
Master of Science (Pharmacy)	0	0	1	1	0	0	0	0	1	0	16	19																									
Master of Social Work	4	11	4	5	4	9	9	5	4	10	257	322																									
Master of Women's Studies	2	0	2	0	1	1	2	3	2	0	20	33																									
Total Masters	287	263	302	177	321	212	296	239	243	204	7,369	9,913																									

# Chapter 3

## Dealing with Errors

$\text{\LaTeX}$  can produce cryptic error messages at times. However, with some experience, it is usually not too difficult to determine what the problem is and how to fix it.

As mentioned earlier, appropriate search terms in Google may help you fix these error messages.

# References

Lamport, L. (1994). *Latex: A document preparation system*. Addison-Wesley.