The abstract page is a required component of the thesis/dissertation. The abstract should be a brief summary of the paper, stating only the problem, procedures used, and the most significant results and conclusions. Explanations and opinions are omitted. Remember to include the necessary information regarding any multimedia components included in the document. The abstract must be approved by your advisor/committee chair.
SAMPLE USING THE NEW UNCG DISSERTATION CLASS WITH TIPS

by

Joe Michael Schmoe

A Dissertation Submitted to
the Faculty of The Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro
2018

Approved by

__________________________________________
Committee Co-Chair

__________________________________________
Committee Co-Chair
The dedication is often short. Longer statements are usually in the acknowledgements. The dedication is optional.
This dissertation written by Joe Michael Schmoe has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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ACKNOWLEDGMENTS

It is customary to recognize the assistance of the advisor and/or committee chair, all other members of the committee, and only those organizations and/or persons who actually aided the research. If financial support was provided to make the study possible, credit for such assistance should be given.
PREFACE

A preface is a statement that either explains the author’s reasons for pursuing this subject matter or provides a personal comment about the subject that would not otherwise be included in the document.
# TABLE OF CONTENTS

| LIST OF TABLES | vii |
| LIST OF FIGURES | viii |

## CHAPTER

I. **THIS IS A CHAPTER TITLE** ................................................. 1

   I.1. **Capitalize Each Important Word in a Section Title** ........... 1

II. **TYPESETTING SOME MATHEMATICS** ................................. 2

   II.1. **Constructions You Will Use a Lot** ............................ 2

III. **ODDS AND ENDS** .......................................................... 7

IV. **FINAL PUSH** .................................................................... 8

   IV.1. **The Bibliography** .................................................. 8

   IV.2. **Dealing with Formatting Issues** ................................. 8

**BIBLIOGRAPHY** .................................................................... 10

**APPENDIX A. **WHY USE APPENDICES?** ................................. 11
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table II.1. Some Title for This Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table II.2. Meaning of Street Light Colors</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>
LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure II.1. Spartan Logo</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>
CHAPTER I
THIS IS A CHAPTER TITLE

You are required to have chapters in your thesis/dissertation. It is also a good idea because it will keep you organized. You can choose to type chapters in the main \LaTeX document as I do here, or if you want you can keep your chapters in separate files and use \texttt{include} to put them here.

I.1. Capitalize Each Important Word in a Section Title

Make sure you do not have a section unless you have multiple sections. I break this rule in this document so that you can see what not to do. Turn back to the table of contents and notice that there is only one subsection in this chapter. This is bad style that should be avoided.

Note that every important word in the section title is capitalized. While I was taught you should not do this, the Graduate School here requires it.

Capitalize Each Important Word in a Subsection Title

Make sure you do not have a subsection unless you have multiple subsections. Although \LaTeX will allow you further subdivisions, I would not recommend it. If you choose to further subdivide your document, you must adjust the format in the class file to match the UNCG guidelines. The class file only corrects the typesetting up to subsections.
CHAPTER II

TYPESETTING SOME MATHEMATICS

In the sections below, you will find some basic constructions. For more elaborate typesetting, ask your local \TeXnician. Be sure to look at the \LaTeX source code along with the output so that it makes sense.

II.1. Constructions You Will Use a Lot

Any math should be enclosed in dollar signs so that it shows up like this \( x = 2 \). Alternatively, you can use slash parentheses \( x = 2 \). You put displayed math—meaning on its own line, centered, like this

\[ a^n + b^n = c^n. \]

Don’t forget the period to end the sentence. Use this construction when you need a one line displaymath type equation that will not be referenced later. Note that it does not have a reference number.

It is important to label things that you might refer to at some point. For example, suppose you have a really important equation

\[ a + b = c. \] (II.1)

Then you can refer to the equation later like this [II.1]. If you are using the hyperref package like this sample, these references can be clicked to warp back to the referring point. Be sure that you are NEVER typing in the reference numbers yourself. The reference numbers will change as you edit and write.

A nice package is showkeys. You use this while you are writing your dissertation
will reveal the labels so that you don’t need to remember them.

When you refer to a page, use \texttt{\textbackslash pageref}. When you refer to a Theorem, Corollary, Chapter, etc by number, use \texttt{\textbackslash ref}. Use \texttt{\textbackslash eqref} to refer to equations. Note the use of the tilde instead of a space to ensure that the line break does not occur between the word “Chapter” and the number in Chapter II.

When you want to align some mathematics, use \texttt{\textbackslash align} or \texttt{\textbackslash align*}. The starred version is to be used if you do not want the equations numbered or labelled. Do not use \texttt{\textbackslash equationarray} as the spacing will be wrong.

**Theorem II.1.** If there exists numbers $a$ and $b$ such that $a = b$, then $1 = 2$.

**Proof.** Suppose $a = b$. Then

\[
\begin{align*}
a^2 &= ab \\
2a^2 &= a^2 + ab \\
2a^2 - 2ab &= a^2 - ab \\
2(a^2 - ab) &= a^2 - ab.
\end{align*}
\]

Divide both sides by $a^2 - ab$ to get the desired result. \hfill \Box

Theorem II.1 immediately implies the following.

**Corollary II.2.** I am the pope.

Here is how you do citations. Here are a few more references \cite{Sta79, EGM98} and \cite{Ash77, Theorem 1}. You can also cite websites \cite{Wik13} Be sure to latex, bibtex, latex, bibtex, latex after you add a new reference. The extra latex may or may not be necessary, but at least once before and after the bibtex call most definitely are required. You should latex at least twice before submitting to be sure the page count is correct on the abstract page.
Lemma II.3. Lemmas are statements that are helpful for proving theorems.

Theorem II.4 (A Nice Theorem). Theorems are your big results. The square brackets in the \textit{tex} file show you how to format things when the theorem has a name.

Proof. Most theorems should be followed directly by a proof. This is how you create a proof environment. The nice QED box shows up automatically at the end. □

Corollary II.5. Corollaries are facts that follow easily from results in theorems.

Here is how you typeset an algorithm. Notice that the outside construction is so that you can get the labels and numbering right. The inner \texttt{uncgalgorithm} environment takes two inputs—input and output.

Algorithm II.6 (Shampoo Bottle Method). This is how you wash your head.

Input: Dirty hair

Output: Clean hair

1. Lather.

2. Rinse.

3. Repeat.

Proposition II.7. Propositions tend to be my default position on results. Only the big results are deemed Theorems.

Definitions are the foundation of good mathematics.

Definition II.8. A positive integer is \textit{perfect} if it is equal to the sum of its proper positive divisors.

Example II.9. 6 is perfect because $6 = 1 + 2 + 3$. 
Constructions You May Have To Use

Some areas of mathematics requires the use of tables, arrays, or figures. Arrays are to be used in math mode, while tables are not.

Table II.1. Some Title for This Table. This is where a longer description would go.

<table>
<thead>
<tr>
<th>This example table</th>
<th>is</th>
<th>an</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>of</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td>showing various</td>
<td>options.</td>
</tr>
</tbody>
</table>

Table captions go above the table. Note the use of `titlecaption` above the Table II.1. This is a macro that I wrote (see the preamble). I did this because of the Graduate School requirement that each table and Figure have a title. Each important word of the title should be capitalized. The title goes in the List of Figures/Tables. You should put the caption above tables and below figures. Also note the use of `centering`. This gets rid of a bit of extra whitespace and is suggested for figures and tables. You can look online for more intricate tables, as well as lengthy discussions about the proper way to present data (lines versus no lines). We also make use of the `booktabs` package in Table II.2. Notice the blank line before the table. This allows `\LaTeX` to end this paragraph, which usually results in better placement of the table. If you find that the table is not placed correctly (perhaps splitting a line mid-sentence) utilize the `[htbp]` option as shown in Table II.2.

Table II.2. Meaning of Street Light Colors.

<table>
<thead>
<tr>
<th>Colors</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red</td>
<td>Stop</td>
</tr>
<tr>
<td>Green</td>
<td>Go</td>
</tr>
<tr>
<td>Yellow</td>
<td>Speed up</td>
</tr>
</tbody>
</table>
Figure II.1. Spartan Logo. The UNCG Spartan Logo is shown here at 0.65 of the text width.

You may also come across the need to have a figure. You will need to use the package `graphicx`. Note that defining the width, but not the height will scale the image both vertically and horizontally so that it does not become distorted. The size can be an absolute size, or, as is done in Figure II.1, the size can be relative to the width of the text.
CHAPTER III
ODDS AND ENDS

There are a few things that you should keep in mind.

1. The default font size is 12 pt. Be nice to the readers of your dissertation. Do not make this smaller unless you have good reason to do so.

2. The default degree of the class file is PhD. If you are using the class file for a Masters thesis, be sure to pass the \texttt{ma} option to the class file.

3. Don’t mess with the spacing of things by hand too much. If you find that something is wrong, it is better for the future generations of grad students to address the issue in the class file.

4. If you want to print a copy for a colleague, but want to save trees, you can obtain singlespacing by using

\begin{verbatim}
\renewcommand{\doublespacing}{\singlespacing},
\end{verbatim}

which essentially redefines doublespacing to mean singlespacing.
CHAPTER IV
FINAL PUSH

IV.1. The Bibliography

That looks like the end of the material, but you are still required to have a bibliography. There is a nice structure for organizing your references and creating a bibliography. Most math references you need will have the citation information on http://www.ams.org/mathscinet/. You can cut and paste the bibtex information into your bib file. Don’t worry if you don’t cite all of the references from your bib in your paper. Bibtex is smart enough only to put the ones you reference into your bibliography. Whenever you reference a new article in your paper, you need to do the following.

1. Run latex so that it knows you cite a new source.

2. Run bibtex to grab the citation information from your bib file.

3. Run latex so that the information gets placed in your document.

IV.2. Dealing with Formatting Issues

LaTeX does a great job of making the right choices for formatting, but sometimes the Graduate School disagrees. Here are some common issues, and how to correct them. These are fixes that you do at the end, after your content is complete.

Widows and Orphans

You can read about widows and orphans at

https://en.wikipedia.org/wiki/Widows_and_orphans
To fix such things, you need to either add or delete a line from a given page. This can be achieved most cleanly by using the command \enlargethispage. This will enlarge the \textheight for the current page by the specified amount; e.g. \enlargethispage{\baselineskip} will allow one additional line. You can use negative amounts to shrink the page.

*Float in the Middle of a Sentence*

Sometimes, you will have a figure or a table float to the top of a page, where it splits a sentence from the previous page. You can usually avoid this by the following.

1. Put the float after the paragraph. Be sure to have a blank line before the start of the float so that \LaTeX\ knows the paragraph is complete.

2. Use the [htbp] option on to tell \LaTeX\ that you prefer it placed after the paragraph.

If this doesn’t work, there are other options to try. This includes putting your float later in the document, or utilizing a package such as \texttt{placeins}, which defines a function called \texttt{FloatBarrier}. 
BIBLIOGRAPHY


APPENDIX A

WHY USE APPENDICES?

After the bibliography is an optional portion of appendices. The appendices may contain tables of data that would interfere with the easy reading of the text, development of mathematical treatments, very long quotations, schedules, forms, interviews, inventories, samples of test items, surveys, illustrative materials, and any other supplementary material considered worthy of recording or too detailed to be included in the text. If diverse materials are included, they should be grouped into categories and each category labeled as a separate appendix (ex: Appendix A. Tables; Appendix B. Consent Forms; etc.) The Graduate School does not allow appendices to have sections.