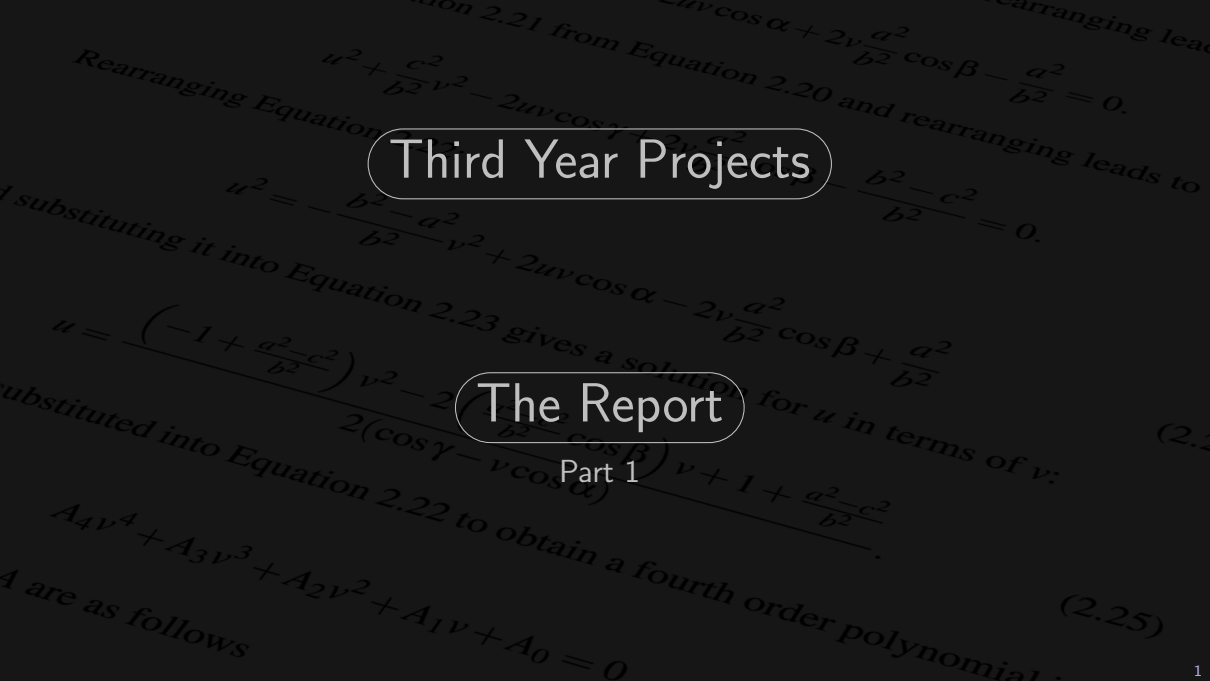


Third Year Projects

The Report

Part 1



Learning Outcomes

After this talk, you will:

- ▶ Appreciate the importance of the project report
- ▶ Be aware of some essential content for your report
- ▶ Be able to plan your report
- ▶ Augment your technical writing toolbox and apply it to the creation a good report

The Report

- ▶ Your report is a written record of what you have done
- ▶ Imagine that your report will be used by others to reproduce or advance your work
- ▶ Give the reader the information to be able to do this

The Report

► It should be a standalone piece of work

► Allow the reader to understand:

► What you've done and why

► How you did it

► What the outcome was

The Report

- ▶ Writing the report will give you valuable experience in:
 - ▶ Documenting your work
 - ▶ Explaining your ideas to others
- ▶ In your career you will need these skills to create, for example:
 - ▶ Requirements specifications
 - ▶ Technical papers
 - ▶ User manuals
 - ▶ Training courses

The Report

- ▶ The report makes up a large proportion of your final mark
- ▶ Don't leave it until too late to start
- ▶ You have got a month between the end of practical work and submission of the report

Writing Tools

▶ L^AT_EX

▶ TexWorks (Linux)

▶ MiKTeX (Windows)

▶ Overleaf (Online)

▶ LibreOffice Writer

▶ Microsoft Word

► There is a UoM L^AT_EX template available

► But there isn't one for other tools
(Use the example report as a guide)

Backup your Work

Make frequent backups of your work

- ▶ Use a version control system such as git
- ▶ Keep a copy online (on gitlab, for example)
- ▶ Commit and push frequently

Or:

- ▶ Zip up the folder each day
- ▶ Keep backups somewhere else

Example Report Content

Title Page

Contents

List of Tables

List of Figures

Abbreviations

Abstract

Declaration

Copyright

Acknowledgements

1. Introduction

2. Background

3. Design or Methodology

4. Results

5. Evaluation

6. Conclusions

Bibliography

Appendices

Third Year Projects

The Report

Part 2

Example Report Content

Title Page

Contents

List of Tables

List of Figures

Abbreviations

Abstract

Declaration

Copyright

Acknowledgements

1. Introduction

2. Background

3. Design or Methodology

4. Results

5. Evaluation

6. Conclusions

Bibliography

Appendices

Example Method

- ▶ Create a table of contents for your report
- ▶ Write down the chapters
- ▶ Write down the sections in each chapter for the things you want to talk about
- ▶ Type this out as a list, OR
- ▶ Create chapters and sections in your report so that a proper table of contents is generated

Example

3. Design

3.1 Web Architecture

3.2 Back-end

3.2.1 Database Schema

3.2.2 Scripting Framework

...

3.3 Front-end

...

Example Method

- ▶ You can then start on your report:
- ▶ Use these chapters and sections to set up your doc
- ▶ Write something in each section
 - ▶ You can do them in any order
 - ▶ Initially, don't worry about formatting and spelling
 - ▶ Just get things out of your head and into the doc

Example Method

- ▶ Don't stop writing to look things up
- ▶ Write something like
'TODO: put db size limit table here'
- ▶ Later, search for your TODO markers and sort them out

Example Method

- ▶ Once you start writing something in your sections, your report will quickly grow and motivate you to continue

HOW TO WRITE THESES WITH TWO LINE TITLES

A REPORT SUBMITTED TO THE UNIVERSITY OF MANCHESTER
FOR THE DEGREE OF BACHELOR OF SCIENCE
IN THE FACULTY OF SCIENCE AND ENGINEERING

2023

Student id: 12345678

School of Computer Science

Table of Contents

Contents

Abstract	11
Declaration	12
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1 Introduction	17
1.1 Drone Geolocalisation	19
1.1.1 Self-Localisation	19
1.1.2 Object-Localisation	22
1.2 Visual Geolocalisation	23



Don't forget to number the pages of the report

Lists

To allow for easy navigation of your report,
consider adding a

► List of figures

List of Figures

1.1 GPS satellite constellation	18
1.2 Signal reflections in an urban canyon	19

► List of tables

List of Tables

4.1 List of ORB parameters in OpenCV	127
4.2 List of ORB parameter values used in the sweep	127

To allow for easy understanding of your report, add a

▶ List of abbreviations

Abbreviations

ANN	Artificial Neural Network
API	Application Programming Interface
BLOB	Binary Large Object (in databases)

Abstract

- ▶ Summarise the project and state the key outcomes
- ▶ Write it when you have finished your report
- ▶ Read some abstracts from technical papers to get an idea of what to write

Declaration

No portion of the work referred to in this report has been submitted in support of an application for another degree or qualification of this or any other university or other institute of learning.

Perhaps not necessary for an undergraduate degree

Copyright

Copyright

- i. The author of this thesis (including any appendices and/or schedules to this thesis) owns certain copyright or related rights in it (the "Copyright") and s/he has given The University of Manchester certain rights to use such Copyright, including for administrative purposes.
- ii. Copies of this thesis, either in full or in extracts and whether in hard or electronic copy, may be made **only** in accordance with the Copyright, Designs and Patents Act 1988 (as amended) and regulations issued under it or, where appropriate, in accordance with licensing agreements which the University has from time to time. This page must form part of any such copies made.
- iii. The ownership of certain Copyright, patents, designs, trade marks and other intellectual property (the "Intellectual Property") and any reproductions of copyright works in the thesis, for example graphs and tables ("Reproductions"), which may be described in this thesis, may not be owned by the author and may be owned by third parties. Such Intellectual Property and Reproductions cannot and must not be made available for use without the prior written permission of the owner(s) of the relevant Intellectual Property and/or Reproductions.
- iv. Further information on the conditions under which disclosure, publication and commercialisation of this thesis, the Copyright and any Intellectual Property and/or Reproductions described in it may take place is available in the University IP Policy (see <http://documents.manchester.ac.uk/DocuInfo.aspx?DocID=467>), in any relevant Thesis restriction declarations deposited in the University Library, The University Library's regulations (see <http://www.manchester.ac.uk/library/aboutus/regulations>) and in The University's policy on presentation of Theses

You can copy it from the sample report

Acknowledgements

► Your chance to thank anybody
that has helped you:

- Your supervisor
- Friends
- Parents

$$u^2 + \frac{c^2}{b^2}v^2 - 2uv \cos \gamma + 2v \frac{a^2}{b^2} \cos \beta - \frac{a^2}{b^2} = 0. \quad (2.20)$$

Rearranging Equation 2.22:

$$u^2 = \frac{b^2 - c^2}{b^2}v^2 + 2v \frac{a^2}{b^2} \cos \beta - \frac{a^2}{b^2} = 0. \quad (2.21)$$

substituting it into Equation 2.23 gives a quadratic equation for u in terms of v :

$$u = \frac{\left(-1 + \frac{a^2 - c^2}{b^2}\right)v^2 - 2\left(\frac{a^2}{b^2} \cos \beta\right)v + 1 + \frac{a^2 - c^2}{b^2}}{2(\cos \gamma - \cos \beta)} \quad (2.22)$$

substituted into Equation 2.22 to obtain a fourth order polynomial:

$$A_4v^4 + A_3v^3 + A_2v^2 + A_1v + A_0 = 0 \quad (2.25)$$

A_4 are as follows

Third Year Projects

The Report

Part 3

Introduction

- ▶ Get the reader up to speed on your project
Don't leave the reader guessing
- ▶ State the aims of the project
- ▶ Perhaps talk about your project plan
- ▶ Provide a roadmap for your report
(brief description of the following chapters)

Example content

- ▶ Literature review
- ▶ Summary of similar systems to yours
- ▶ Explanations of concepts that you will rely on later
- ▶ Advantages and disadvantages of different approaches, algorithms, experiments, etc.
- ▶ Point out problems that you are going to improve on (direct the reader to later sections)
- ▶ Cite all of your references

- ▶ Use an appropriate design methodology
- ▶ If doing a software development project, for instance,
 - ▶ Do a requirements analysis and list of requirements
 - ▶ Use design diagrams (for example, UML)
 - ▶ Create line drawing designs for front-ends, etc.
- ▶ Where appropriate, write mathematics or algorithms
 - ▶ Describe the testing methodology:
 - ▶ Design of tests
 - ▶ Maybe include a list of tests in an appendix

Results

- ▶ Experimental results
- ▶ Results of software or hardware testing
- ▶ Summarise in some way if there is a lot of data
- ▶ Screen shots of your UI or program outputs

Evaluation

- ▶ Evaluate experimental results
- ▶ Discuss test results for an implementation
 - does it do what it is supposed to?
- ▶ How well does your algorithm, system, or methodology compare to others
- ▶ UI survey results

Conclusions (and Further Work)

- ▶ Summarise your results
- ▶ Have your aims been achieved?
- ▶ Any things that can be improved?
- ▶ Ideas for further work
 - Bigger ideas for what your work could lead to

Bibliography

Bibliography

- [1] M. Abadi, A. Agarwal, P. Barham, E. Brevdo, Z. Chen, C. Citro, G. S. Corrado, A. Davis, J. Dean, M. Devin, S. Ghemawat, I. Goodfellow, A. Harp, G. Irving, M. Isard, Y. Jia, R. Jozefowicz, L. Kaiser, M. Kudlur, J. Levenberg, D. Mané, R. Monga, S. Moore, D. Murray, C. Olah, M. Schuster, J. Shlens, B. Steiner, I. Sutskever, K. Talwar, P. Tucker, V. Vanhoucke, V. Vasudevan, F. Viégas, O. Vinyals, P. Warden, M. Wattenberg, M. Wicke, Y. Yu, and X. Zheng. TensorFlow: Large-scale machine learning on heterogeneous systems, 2015. Software available from tensorflow.org.
- [2] A. Abbas, A. Jafar, and Z. Dahrouj. Target localization from a uav using 3d terrain engine. In *The International Conference on Electrical Engineering*, volume 10, pages 1–16. Military Technical College, 2016.
- [3] Acuity Laser. Ar3000 distance measurement sensor. <https://www.acuitylaser.com/product/laser-sensors/long-range-sensors/ar3000-distance-measurement-sensor/>, 2021. Accessed: 2021-07-14.

- Use the referencing functionality of your writing tool
- Don't try to manage the references yourself

- ▶ Additional screen dumps of your UI
- ▶ Full results that you summarised (unless there are masses of them)
- ▶ Don't add loads of source code
- ▶ The report should make sense without appendices
 - For when the reader wants this extra data

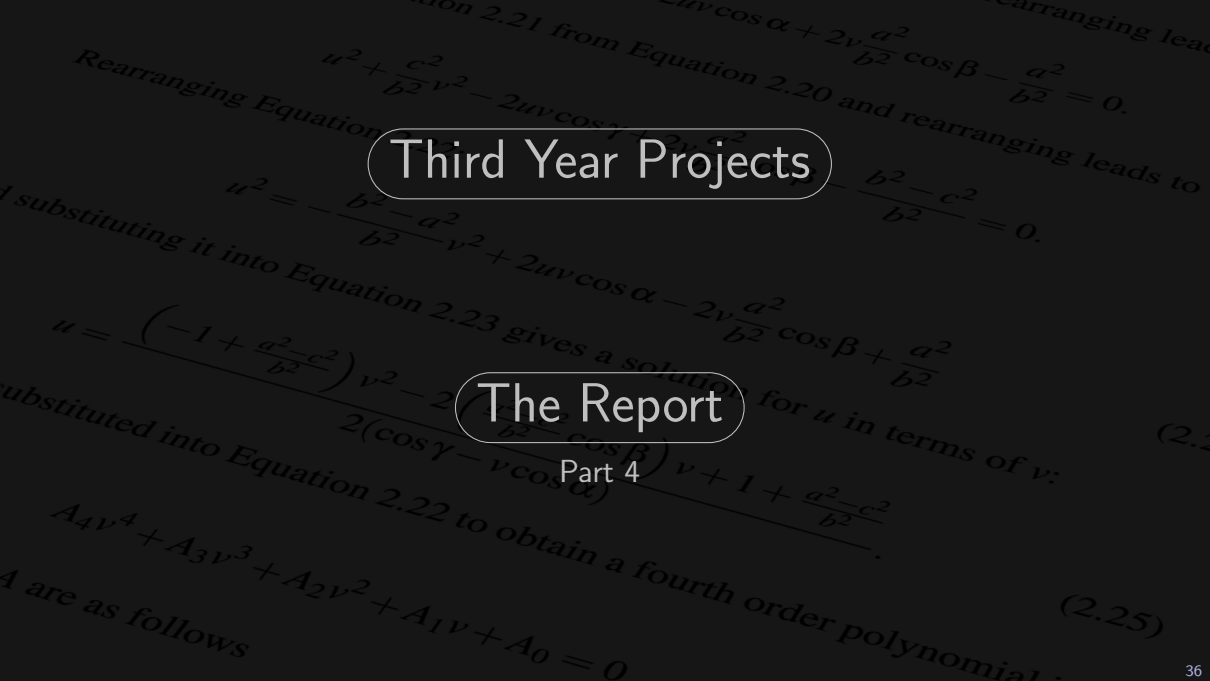
Chapter Titles and Contents

- ▶ You do not need to follow the example above
- ▶ Your choice of titles and contents
- ▶ Make sure that the report flows well and takes the reader through your work
- ▶ The reader shouldn't be left wondering about something you don't mention until later
- ▶ Discuss your report structure with your supervisor

Third Year Projects

The Report

Part 4



Abbreviations

Always define your abbreviations on first use:

“The Application Programming Interface (API) provided a number of functions... This API was selected...”

However, in a large report, the reader may forget:

Hence, the inclusion of a **List of Abbreviations**

Aside

Acronym

is not a synonym for

Abbreviation

Equation 2.21. Rearranging leads to

$$u^2 + \frac{c^2}{b^2}v^2 - 2uv \cos \gamma + 2v \frac{a^2}{b^2} \cos \beta - \frac{a^2}{b^2} = 0.$$

Rearranging Equation 2.22:

$$u^2 = -\frac{b^2 - a^2}{b^2}v^2 + 2uv \cos \alpha - 2v \frac{a^2}{b^2} \cos \beta + \frac{a^2}{b^2}$$

and substituting it into Equation 2.23 gives the solution for u in terms of v :

$$u = \frac{\left(-1 + \frac{a^2 - c^2}{b^2}\right)v^2 - 2\left(\frac{a^2 - c^2}{b^2} \cos \alpha\right)v + 1 + \frac{a^2 - c^2}{b^2}}{2(\cos \gamma - \cos \alpha)}.$$

Substituted into Equation 2.22 to obtain a fourth order polynomial:

$$A_4v^4 + A_3v^3 + A_2v^2 + A_1v + A_0 = 0$$

where A_4 are as follows

Aside

▶ Abbreviation – shortened form of a word or phrase

▶ Contractions:

don't, Ltd.

▶ Initialisms:

CPU, UAV, IDE, LED

▶ Acronym – an initialism that is *said* as a word

e.g. RAM, ROM, Laser, Radar, ASIC

Aside

Do not entitle your 'Abbreviations' section as 'Acronyms'

Abbreviations

ANN	Artificial Neural Network
API	Application Programming Interface
BLOB	Binary Large Object (in databases)

You could call it 'Abbreviations and Acronyms'
if you so desire

Aside

Dictionary definitions

abbreviation

Word Frequency ●●●●●●

in British English

(əˌbrɪːviːˈeɪʃən) 🔊 ⓘ

NOUN

1. a shortened or contracted form of a word or phrase used in place of the whole
2. the process or result of abbreviating

acronym

Word Frequency ●●●●●●

in British English

(ˈækronɪm) 🔊 ⓘ

NOUN

a pronounceable name made up of a series of initial letters or parts of words; for example, *UNESCO* for the *United Nations Educational, Scientific, and Cultural Organization*

Collins English Dictionary. Copyright © HarperCollins Publishers

Note the word ‘pronounceable’

Figures, Tables & Captions

- ▶ **Always** refer to your figures and tables in the text
e.g. “As shown in Figure 3.8, the design includes...”
- ▶ Add a meaningful caption to each figure and table that can be read in isolation:

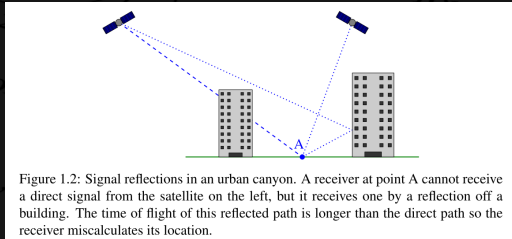


Figure 1.2: Signal reflections in an urban canyon. A receiver at point A cannot receive a direct signal from the satellite on the left, but it receives one by a reflection off a building. The time of flight of this reflected path is longer than the direct path so the receiver miscalculates its location.

Figure Size

- ▶ Make figures a reasonable size
 - not too small or too large
- ▶ If there is text in the figure,
 - resize the figure so that the text is a similar size to your document font

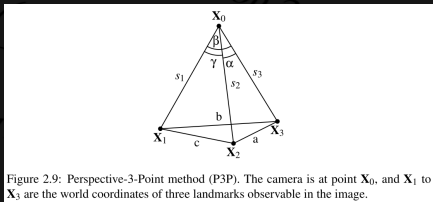


Figure 2.9: Perspective-3-Point method (P3P). The camera is at point X_0 , and X_1 to X_3 are the world coordinates of three landmarks observable in the image.

Reasonably sized figure

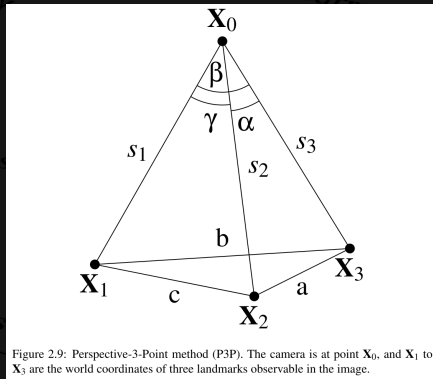
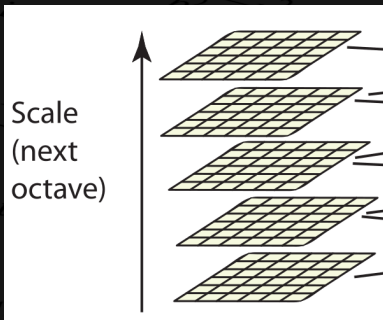


Figure 2.9: Perspective-3-Point method (P3P). The camera is at point X_0 , and X_1 to X_3 are the world coordinates of three landmarks observable in the image.

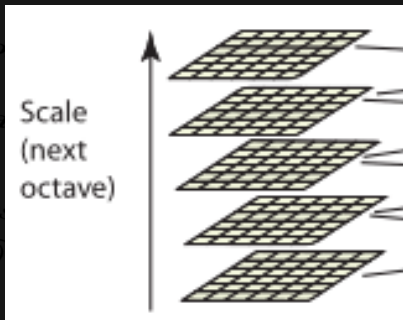
Figure too large

Figure Resolution

- ▶ If capturing images from a book or a paper, screen-grab them at a good resolution



At high resolution



At low resolution

Figure Resolution

- ▶ You can get original resolution images from a pdf file by doing right-click→save on the image in the pdf viewer
- ▶ If creating your own diagrams in an external application, save them in pdf format and use includegraphics
- ▶ Alternatively, learn how to use the \LaTeX drawing macro packages such as pstricks or tikz

Third Year Projects

The Report

Part 5

Referencing

- ▶ Use a short citation format e.g. [12] or maybe (Jones, 2015)
- ▶ Longer formats make it difficult to read, especially when there are many on a line
- ▶ Sort the bibliography in alphabetical order on author's surname (not order of appearance in text)

Referencing

LaTeX abbrev style

This simple flat-Earth method is adopted in [17, 57, 88, 174, 212]. Gibbins in [71] used essentially a flat-Earth model but with an elliptical approximation to the shape of the Earth.

LaTeX alpha style

This simple flat-Earth method is adopted in [BRM⁺06, DKJG06, Hem14, RMBT06, WLZ17]. Gibbins in [GRS04] used essentially a flat-Earth model but with an elliptical approximation to the shape of the Earth.

LaTeX apalike style

This simple flat-Earth method is adopted in [Barber et al., 2006, Dobrokhodov et al., 2006, Hemerly, 2014, Redding et al., 2006, Wang et al., 2017]. Gibbins in [Gibbins et al., 2004] used essentially a flat-Earth model but with an elliptical approximation to the shape of

Using L^AT_EX

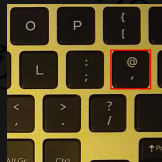
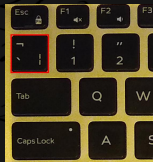
► If things don't look correct,
find out how to do them properly

► The following slides will cover
a few common problems

Quotation marks

“quote” or ‘quote’

Use single back quotes to open
and single ordinary quotes to close



Back Quote

Quote

Non-breaking spaces

2 kg (2\,kg)

or

2 kg (2~kg)

Incidentally, units of measure are not written in italics
so **don't** write *2kg* (\$2 kg\$)

Long and short captions

- ▶ Captions on figures and tables appear in the lists of figures and captions
- ▶ You can supply a short comment for the lists:
`\caption[Short caption.]{Long caption.}`

Hyperlinks

Figure [2.3](#) shows the rendering of a Lidar model. This comes from a dataset of the UK government which has made Lidar scans of the UK [\[56\]](#). The data is available at 1 m and 2 m resolutions.

`\usepackage{hyperref}`

Brackets

Brackets in equations

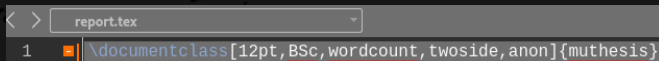
$$y = \sqrt{2} \left(\frac{1}{1 + \frac{1}{x+2}} \right)$$

$$y = \sqrt{2} \left(\frac{1}{1 + \frac{1}{x+2}} \right)$$

$$y = \sqrt{2} \left(\frac{1}{1 + \frac{1}{x+2}} \right)$$

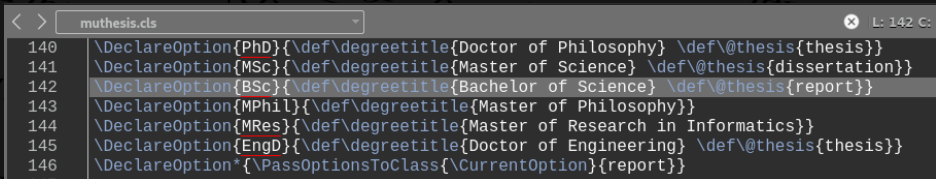
(2.25)

The muthesis.cls is not set up for undergraduate degrees so it won't know BSc if you write it in your documentclass:



```
< > report.tex
1 \documentclass[12pt,BSc,wordcount,twoside,anon]{muthesis}
```

Add the highlighted line to muthesis.cls:



```
< > muthesis.cls L: 142 C:
140 \DeclareOption{PhD}{\def\degreetitle{Doctor of Philosophy} \def\@thesis{thesis}}
141 \DeclareOption{MSc}{\def\degreetitle{Master of Science} \def\@thesis{dissertation}}
142 \DeclareOption{BSc}{\def\degreetitle{Bachelor of Science} \def\@thesis{report}}
143 \DeclareOption{MPhil}{\def\degreetitle{Master of Philosophy}}
144 \DeclareOption{MRes}{\def\degreetitle{Master of Research in Informatics}}
145 \DeclareOption{EngD}{\def\degreetitle{Doctor of Engineering} \def\@thesis{thesis}}
146 \DeclareOption*{\PassOptionsToClass{\CurrentOption}{report}}
```


- ▶ Perform a spell check and grammar check
- ▶ Proofread
- ▶ Perhaps swap reports with a friend
and proofread each other's
- ▶ Annotate the documents in a pdf reader

Summary

You should now:

- ▶ Appreciate the importance of the project report
- ▶ Be aware of some essential content for your report
- ▶ Be able to plan your report
- ▶ Have augmented your technical writing toolbox

The Report

Thank you for listening

Goodbye