



FACULTY OF ENGINEERING & SURVEY  
DEPARTMENT OF CIVIL ENGINEERING

FINAL YEAR PROJECT REPORT

**Title of Project  
can use a maximum of  
3 lines**

**Subtitle if needed  
can use a maximum of  
3 lines**

LastName1, FirstNames1

LastName2, FirstNames2

Registration Number1

Registration Number2

**Submitted in partial fulfilment of the requirements  
for the award of a degree of  
Bachelor of Engineering (B.Eng.)  
in Civil Engineering of Ndejje University**

Supervised by First supervisor, Second supervisor

May 2021



# Abstract

*This is a succinct summary of of aims, methods, conclusions, results, and significance of your study. The maximum word count should be 300. The abstract enables readers to identify the basic content of the report quickly and accurately, and determine its relevance to their needs, and thus decide whether they need to read the report in its entirety. The abstract should consist of:*

- *A clear and concise statement of the objectives.*
- *Scope of the project.*
- *The methods used to solve the problem.*
- *A brief summary of the solution.*
- *Conclusions and Recommendations.*



# Declaration

We declare that this thesis has been composed solely by myself/ourselves and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgement, the work presented is entirely my/our own.

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Registration Number1	Registration Number2

Date:                      .....

Signature:                      .....

This thesis has been submitted for examination with my/our approval as university supervisors.

First supervisor	Second supervisor
------------------	-------------------

Date:                      .....

Signature:                      .....



## Acknowledgements (optional)

*The content and format of this page are up to the student. The acknowledgement should not exceed 30 words.*





## **Dedication (optional)**

# Contents

<b>Abstract</b>	<b>i</b>
<b>List of Tables</b>	<b>x</b>
<b>List of Figures</b>	<b>xi</b>
<b>List of Symbols, Acronyms and Abbreviations</b>	<b>xii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Background . . . . .	1
1.2 Problem Statement . . . . .	1
1.3 Objectives . . . . .	2
1.3.1 Main Objective . . . . .	2
1.3.2 Specific Objectives . . . . .	2
1.4 Justification . . . . .	2
1.5 Scope . . . . .	2
1.6 Conceptual Framework . . . . .	3
<b>2 Literature Review</b>	<b>4</b>
2.1 Topic One . . . . .	4
2.1.1 Subsection One . . . . .	5
2.1.2 Subsection Two . . . . .	5
2.1.3 Subsection Three . . . . .	5
2.2 Topic Two . . . . .	6
2.3 Topic Three . . . . .	6
<b>3 Methodology</b>	<b>7</b>
3.1 Topic One . . . . .	8
3.2 Topic Two . . . . .	8
3.3 Topic Three . . . . .	8
<b>4 Results and Discussion</b>	<b>10</b>
4.1 Topic One . . . . .	10
4.2 Topic Two . . . . .	11
4.3 Topic Three . . . . .	11

<b>5</b>	<b>Conclusions and Recommendations</b>	<b>12</b>
5.1	Topic One . . . . .	12
5.2	Topic Two . . . . .	13
5.3	Topic Three . . . . .	13
<b>6</b>	<b>References</b>	<b>14</b>
	<b>Appendices</b>	<b>15</b>
	Appendix I: Work plan . . . . .	16
	Appendix II: Budget . . . . .	17
	Appendix III: Questionnaire . . . . .	18

## List of Tables

6.1	Proposed budget . . . . .	17
6.2	Some styles to citation . . . . .	19
6.3	Conductivity values measured for defined salinity values . . . . .	23
6.4	Module CIV4202 Final Year Report - Assessment . . . . .	24

## List of Figures

6.1	Questionnaire . . . . .	18
6.2	Title to a x-bar chart . . . . .	20
6.3	Title to a stacked bar chart . . . . .	20
6.4	Title to a y-bar chart . . . . .	21
6.5	Title to a clustered bar chart . . . . .	21
6.6	Title to the pie chart . . . . .	22
6.7	Title to the line chart . . . . .	22
6.8	GF ball valve 543 kv-characteristic . . . . .	23
6.9	Thermometers showing different temperature readings. . . . .	24
6.10	Heat exchanger with flow of media . . . . .	25
6.11	Example of a flow chart . . . . .	28
6.12	Some sort of a tree . . . . .	28
6.13	Circular diagram . . . . .	29

# List of Symbols, Acronyms and Abbreviations

**ADT** Atlantic Daylight Time.

**UTC** Coordinated Universal Time.

# Chapter 1

## Introduction

*The introduction should "set the stage" for which the work is undertaken. It should go from the general to the specific; that is, begin with a general description of the problem or technology area and proceed to the particular issue that is being addressed. It is not a summary of the work but rather the background and rationale for doing it.*

### 1.1 Background

*Background information and events to acquaint the reader with the purpose for carrying out the work (e.g. production difficulties, redesign, design problems, material selection, excessive deflections, etc.). General references to other work (journals, text books, newspapers, etc.) that help define the problem. This section should have a maximum of one page.*

### 1.2 Problem Statement

*An accurate and concise statement of the problem providing details not included in the abstract that leads into the body of the report. This section should have a maximum of half a page.*

## 1.3 Objectives

*Main objective and the specific objectives to be achieved and scope of activities by which they can be achieved.*

### 1.3.1 Main Objective

*This refers to the overall intention for the research. It is derived from the topic and statement of the problem and should be a summary in one short sentence. The student should state what the study intends to accomplish in general.*

### 1.3.2 Specific Objectives

*Specific objectives arise from the general objective. They focus on the variables and the relationship between them as postulated in the topic, statement of the problem and general objective. The general objective is broken down into 2-3 specific areas of focus that form the specific objectives/issues of the study. Specific objectives are stated in short practical sentences and numbered in Arabic numerals (1, 2, 3). They must be SMART i.e. Specific, Measurable, Achievable, Realistic and Time-bound. Students must have not more than four objectives.*

## 1.4 Justification

*Explain to the reader the urgency and need for the project/ study/ research. Perhaps give situations that have occurred that bring out this urgency – give measures e.g. losses, deaths etc. This section should have not more than two paragraphs of a maximum of six lines each.*

## 1.5 Scope

*The scope of your research simply refers to the boundaries of the research. Physical boundaries can be like the country, district, sub-county, firm, section of a road and so on and can even be put in a table for people who are going to collect data from more than three firms or locations. A map indicating the position of the project area*



*in relation to nearby geographical features should be included. The technical scope comes from the objectives i.e. if you have been contracted to build a structure, your technical scope may be to procure materials, supervise and pay workers, build as per the plan to finishing and then finally commissioning the structure. Maintenance and renovation are outside your scope of work.*

## 1.6 Conceptual Framework

*The conceptual framework is a scheme of concepts or variables and the postulated relationships between them. The variables are operationalised, i.e. broken down into how they are represented in the real world. Operationalisation of the variables helps to give a working definition and the observable equivalents that will represent its occurrence in the real world i.e. its indicators. The value of the conceptual framework is in helping the student to do a number of things through a diagram or illustration.*

- The student looks at different variables (concepts) and how they relate to one another in the stated problem in her/his proposed study.*
- Two or three of the relationships that are most relevant to the student are then picked as the specific objectives of the study.*

*The conceptual framework is a diagrammatic expression that combines your research objectives, methods, and tools and also has a loop or loops to some starting point or earlier points in the flow. The student should state what the diagram/illustration is and what it shows in three paragraphs, not bullets, on the input, process, and output.*

## Chapter 2

# Literature Review

*The purpose of academic research, among others, is to contribute to the body of existing knowledge. The student should show what relevant existing knowledge relates to what s/he wants to do research on. The student should:*

- 1. Seek literature that lends support to the line of argument of the study.*
- 2. The specific objectives of the study should guide what literature to review.*
- 3. The student should assess the findings of other studies to show how they support one's argument and the gaps in existing knowledge as far as the proposed research is concerned.*

*The outcome of literature review is to link one's proposed research to existing knowledge, identify gaps that justify the study and launch the argument for one's own research. It must have a logical flow and one should not over-quote. Any quotes should be limited to the necessary area of investigation and should be documented fully.*

## 2.1 Topic One

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sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

### 2.1.1 Subsection One

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### 2.1.2 Subsection Two

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### 2.1.3 Subsection Three

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## 2.2 Topic Two

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## 2.3 Topic Three

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## Chapter 3

# Methodology

*This is a detailed description of selected methodology and should be presented in unambiguous terms. The section comprises:*

- *Research or project design - which describes the nature and pattern the research followed e.g. whether it is historical, descriptive survey, experimental or quasi experimental and location (optional), etc.*
- *Tools and equipment used to accomplish the project. A full description of each should be detailed.*
- *Research approaches – Qualitative or quantitative.*
- *Description of the geographical area and where population of the study exists.*
- *Description of the population from which samples have been selected.*
- *Data collection methods; including instruments and procedures used in the research or project described.*
- *Data quality control, which refers to reliability and validity of instruments.*
- *Measurements, which refer to the formulae or scales in the study.*
- *Data analysis, which involves organization and interpretation of the data generated. Both raw data and the analyzed form be kept both electronically and hardcopy for further reference later. Follow the following steps in preparing data for analysis: (i) receive the raw data sources (ii) Create electronic data base from the raw data sources (iii) Clean/Edit the database (iv) Correct and clarify the raw data sources (v) Finalize database (vi) Create data files from the data bases.*

### 3.1 Topic One

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### 3.2 Topic Two

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### 3.3 Topic Three

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## Chapter 4

# Results and Discussion

*This section shall specifically include **design calculations, the drawings, the bills of quantities and cost estimates and cost benefit analysis, operations and maintenance plan and environmental impact assessment** of the project.*

- Discussion of the solution - how well does it solve the problem? This section is the heart of the report and should include details of the solution leading up to the proposed design.*
- In addition, discussion of the cost benefit analysis should involve identified costs and benefits for the proposed project, the value attached to them, and assumptions made. The analysis should also include the comparison between costs and benefits and decision criteria used.*

*All of the figures and equations should be computer generated. Conclusive remarks should be made in the next chapter.*

### 4.1 Topic One

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sem vel leo ultrices bibendum. Aenean faucibus. Morbi dolor nulla, malesuada eu, pulvinar at, mollis ac, nulla. Curabitur auctor semper nulla. Donec varius orci eget risus. Duis nibh mi, congue eu, accumsan eleifend, sagittis quis, diam. Duis eget orci sit amet orci dignissim rutrum.

## 4.2 Topic Two

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## 4.3 Topic Three

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## Chapter 5

# Conclusions and Recommendations

*The conclusions should correspond to each of the objectives. This section should include central or important points of the solution as they relate to the problem objectives, recommended courses of action and generalizations of the solution that might relate to other situations. Details not provided in the abstract should be included here.*

### 5.1 Topic One

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## 5.2 Topic Two

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## 5.3 Topic Three

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## Chapter 6

## References

- [1] M. M. Monippally and B. S. Pawar, *Academic Writing: A Guide for Management Students and Researchers*. Los Angeles: Response, 2010, OCLC: ocn551198634, ISBN: 978-81-321-0441-4.
- [2] I. Bouchrika. “How to Write Research Methodology: Overview, Tips, and Techniques,” Guide2Research. (Oct. 16, 2020), [Online]. Available: <https://www.guide2research.com/research/how-to-write-research-methodology> (accessed May 5, 2021).
- [3] L. T. Choy, “The Strengths and Weaknesses of Research Methodology: Comparison and Complimentary between Qualitative and Quantitative Approaches,” *IOSR Journal of Humanities and Social Science*, vol. 19, no. 4, pp. 99–104, 2014, ISSN: 22790845, 22790837. DOI: 10.9790/0837-194399104. [Online]. Available: <http://www.iosrjournals.org/iosr-jhss/papers/Vol19-issue4/Version-3/N0194399104.pdf> (accessed May 5, 2021).
- [4] M. T. Holden and P. Lynch, “Choosing the Appropriate Methodology: Understanding Research Philosophy,” *The Marketing Review*, vol. 4, no. 4, pp. 397–409, Dec. 1, 2004, ISSN: 1469347X, 00000000. DOI: 10.1362/1469347042772428. [Online]. Available: <http://www.ingentaselect.com/rpsv/cgi-bin/cgi?ini=xref&body=linker&reqdoi=10.1362/1469347042772428> (accessed May 5, 2021).

# Appendices

*This section contains all*

- *questionnaires,*
- *interview transcripts,*
- *pilot reports,*
- *detailed tables, etc.*

*This section should contain material that supplements the main text of the report (spreadsheets, detailed experimental results, details of equation derivation, program listings, etc.). If an equation is included in the body of the report, the derivation of that equation could be shown in the Appendix, or if you have a graph from a spreadsheet or program calculation, you could include the spreadsheet data or a program listing in the Appendix. The key point is that the Appendix is supplemental information. Depending on what was requested in the problem statement, detailed drawings might also go in the Appendix and only the overall assembly drawing would go in the body.*

Appendix I: Work plan



## Appendix II: Budget

Table 6.1: Proposed budget

Item	Description	Unit	Quantity	Rate (Shs.)	Amount (Shs.)
1	Food	[1]	2	10,000	20,000
2	Drinks	[1]	2	1,000	2,000
3	Ghost writer	[1]	1	478,000	478,000
<b>TOTAL</b>					<b>500,000</b>

# Appendix III: Questionnaire

The Title

This questionnaire is evaluated automatically. Please use a pen to fill in your answers as follows:

☐ Multiple-choice (select all applicable options)

☐ Single-choice (select only one option)

☒ Selected

☒ Selected

☒ Undo select

☒ Undo select

You can create a customized information element similar to the standard one using the `info` environment. By adding `[noinfo]` to the `questionnaire` environment you can replace the predefined information field with your own.

Which of the following events did you attend?

☐ The Keynote

☐ A workshop

☐ Our glorious party

• Something else entirely

Which one of the following events did you attend?

☐ Talk in room A

☐ Talk in room B

• Something else entirely

Did you like the keynote?

• it was bad ☐ ☐ ☐ ☐ ☐ it was great

☐ I did not attend the keynote

Figure 6.1: Questionnaire to survey something.



## Appendix IV: Some L<sup>A</sup>T<sub>E</sub>X examples

This section is to be deleted/commented by the author.

**Demonstration of citation** Table 6.2 shows some different options on how to cite a source. The examples are done using the `biblatex` package.

Table 6.2: Some styles to citation

Command	Output	Citation
<code>\cite{ref}</code>	[1]	Bare
<code>\textcite[page]{ref}</code>	Monippally and Pawar [1, p. 20]	Textual
<code>\parencite[chapter]{ref}</code>	[1, chap. 4]	Parenthetical
<code>\citeauthor{ref}</code>	Monippally and Pawar	Name
<code>\citeyear{ref}</code>	2010	Year

In his introduction to research methodology writing, Bouchrika refers to some articles [2]–[4].

**Demonstration of abbreviations** Define a glossary entry in file `Acronyms.tex`:

```
\newacronym{utc}{UTC}{Coordinated Universal Time}
```

Use a glossary entry: `\gls{utc}`

This L<sup>A</sup>T<sub>E</sub>Xcode `\gls{utc}` is 3 hours behind `\gls{adt}`.

will produce:

Coordinated Universal Time (UTC) is 3 hours behind Atlantic Daylight Time (ADT).

At the first time usage, the abbreviation is mentioned in brackets. With the second usage of an abbreviation, the abbreviated term itself is not shown any more: UTC is still 3 hours behind ADT.

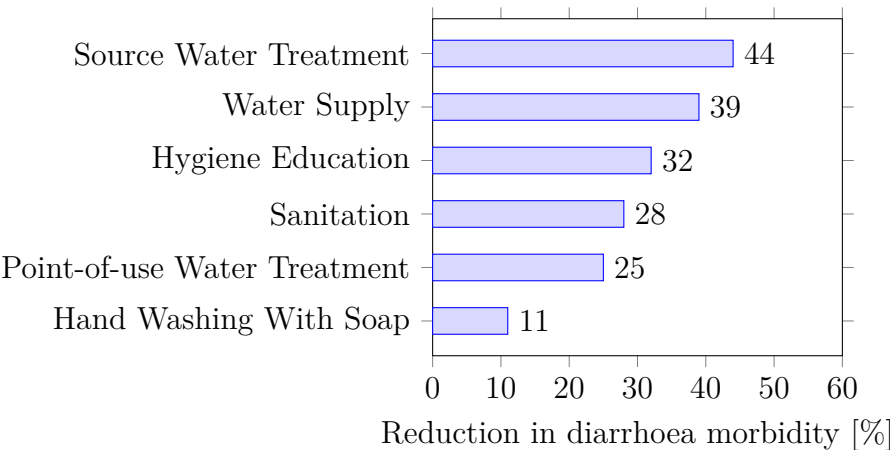


Figure 6.2: Title to a x-bar chart

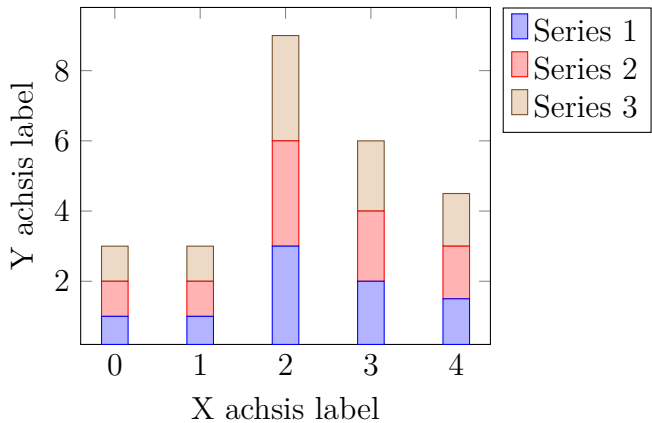


Figure 6.3: Title to a stacked bar chart

**Demonstration of a horizontal bar chart** Fig. 6.2 shows an example of a horizontal bar chart generated with tikzpicture (pgfplots package).

**Demonstration of a stacked bar chart** Fig. 6.3 shows an example of a stacked bar chart generated with tikzpicture (pgfplots package).

**Demonstration of a vertical bar chart** Fig. 6.4 shows an example of a vertical bar chart generated with tikzpicture (pgfplots package).

**Demonstration of a clustered bar chart** Fig. 6.5 shows an example of a clustered bar chart generated with tikzpicture (pgfplots package).

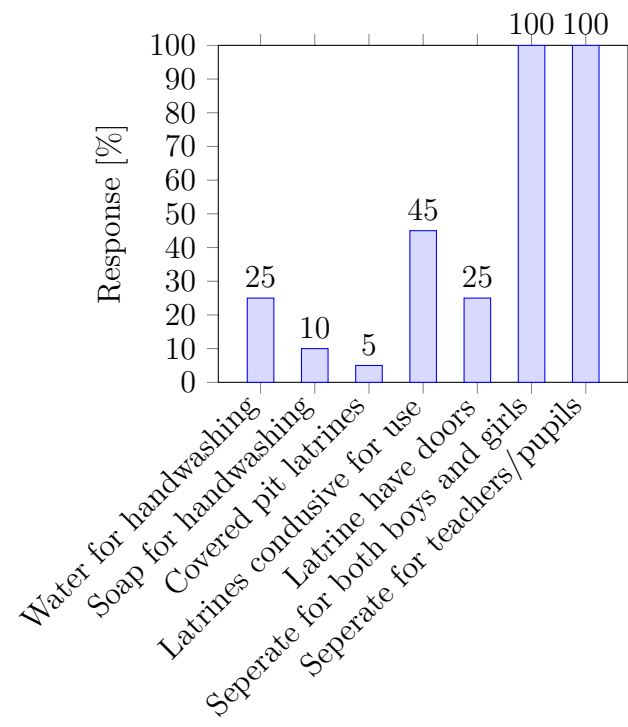


Figure 6.4: Title to a y-bar chart

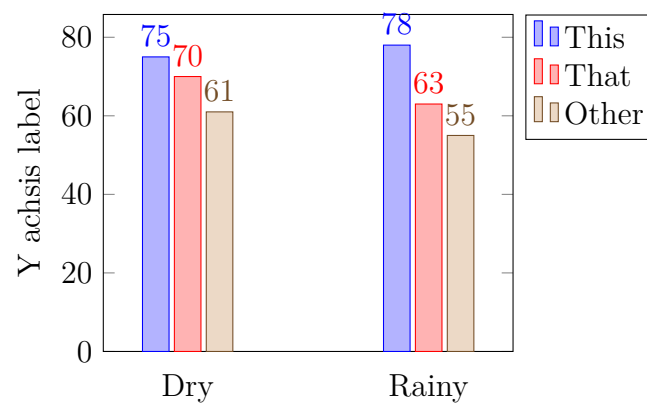


Figure 6.5: Title to a clustered bar chart

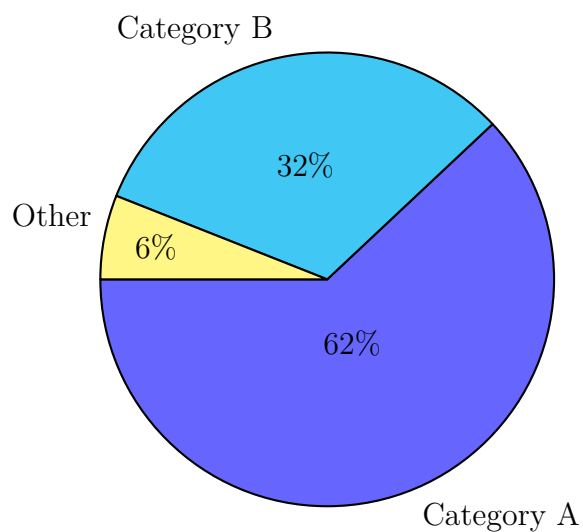


Figure 6.6: Title to the pie chart

**Demonstration of a pie chart** Fig. 6.6 shows an example of a pie chart generated with `tikzpicture` (`pgf-pie` package).

**Demonstration of a line chart** Fig. 6.7 shows an example of a simple chart generated with `tikzpicture` (packages `pgfplots` and `pgfplotstable`). The regression is also rendered and the formula  $y(x_i) = a \cdot x_i + b$  displayed. The values  $a$  and  $b$  will be stored globally.

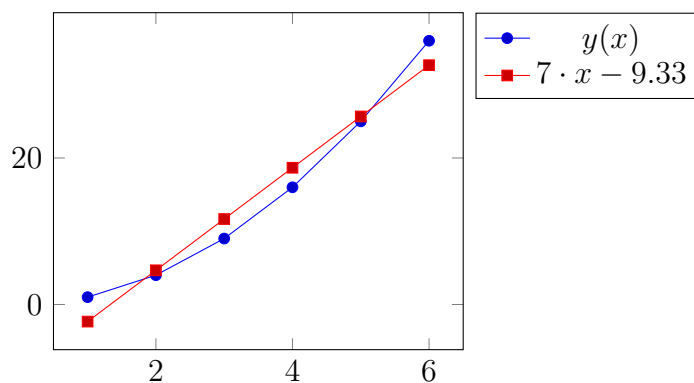


Figure 6.7: Title to the line chart

Table 6.3: Conductivity values measured for defined salinity values

Salinity [g/L]	Electrical Conductivity [mS/cm]
40	63,3
35	55,1
30	47,2
25	40,4
20	32,9
15	25,5
10	17,53
5	9,39

**Demonstration of a table** Table 6.3 shows an example of a table. Different parts of the Final Year Report and their corresponding weights for marking them can be viewed at table 6.4. A help to generate LaTeX tables can be found at <https://www.tablesgenerator.com/>.

**Demonstration of including a section of a PDF** Fig. 6.8 shows an example of a PDF. The section displayed is of a particular page from the PDF and is cropped in size.

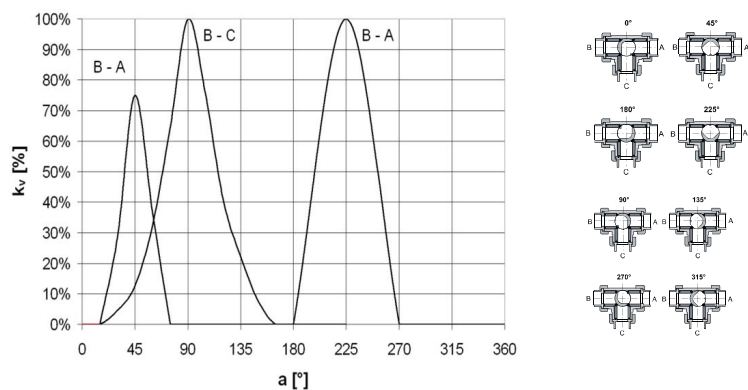


Figure 6.8: GF ball valve 543 kv-characteristic

Table 6.4: Module CIV4202 Final Year Report - Assessment

Category	Chapter or Feature	Weight
Engineering Content (60%)	Introduction and Objectives	10%
	Problem definition	5%
	Literature review	5%
	Methods	15%
	Results and Discussion	15%
	Conclusions and recommendations	10%
Language (25%)	Grammar and spelling	15%
	Sentence structure	10%
References (15%)	Use of references	10%
	Quality and format of references	5%

**Demonstration of including a graphics** Fig. 6.9 shows an image stored as jpg-file. The file is limited to the page width and is rotated by 90°. Because of the rotation 'height' becomes 'width'.



Figure 6.9: Thermometers showing different temperature readings.

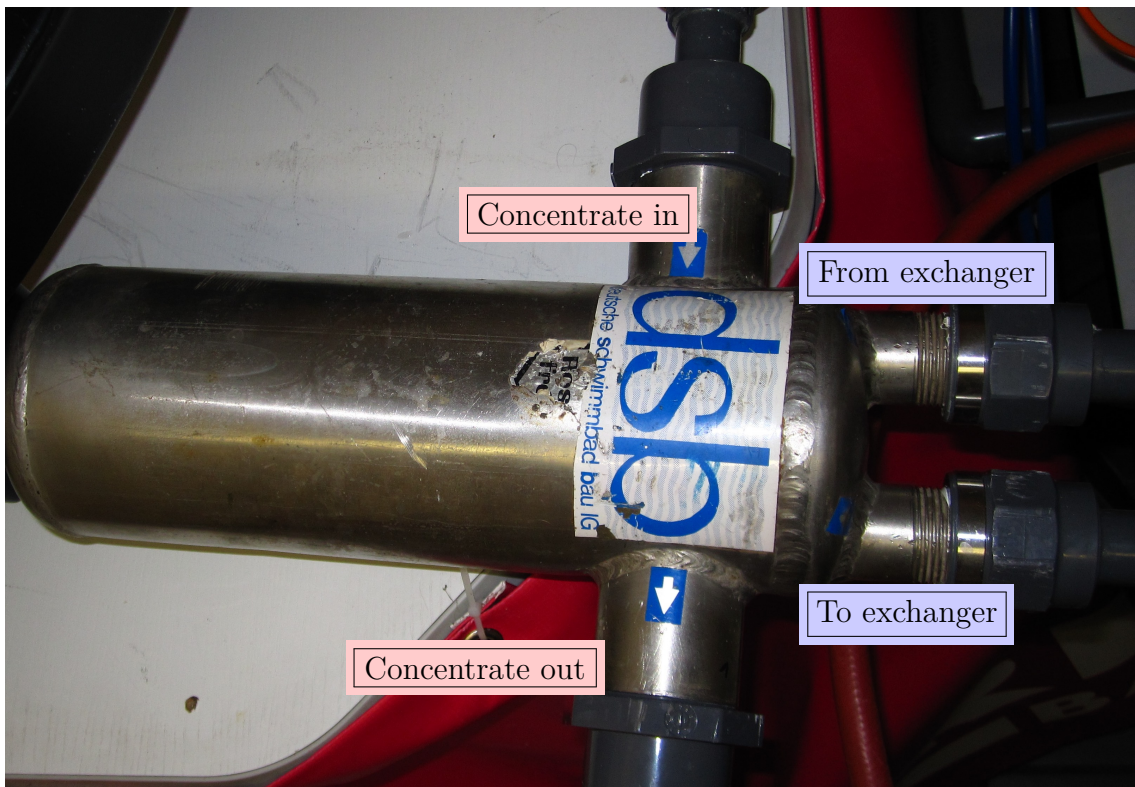


Figure 6.10: Heat exchanger with flow of media

**Demonstration of including a JPG with labels** Fig. 6.10 shows an example of a JPG that has some labels applied.

**Demonstration of links** Use `\href{URL}{DESCRIPTION}` to add a link with description. Use `\url{URL}` to add a link without a description. The Water Research & Development Centre's website: <https://nduwrdc.org>

Very long urls with hyphens are also possible:

<http://www.emarketer.com/blog/index.php/quick-stat-smartphone-users-account-38-mobile-phone-users/>

**Demonstration of equations** Equation (6.1) shows the geometrical projection formula for population growth. The parameters description is done using the macro *conditions*, defined at `NDUmacros.tex`.

$$P_f = P_0 \left(1 + \frac{i}{100}\right)^t \quad (6.1)$$

where:

$P_f$  = Future population  
 $P_0$  = Current population  
 $i$  = Growth rate in %  
 $t$  = Time in years

The Hazen-Williams formula expressed in metric units as seen in (6.2) is used to calculate the headloss.

$$H[m] = \left(\frac{6.78L}{d^{1.165}}\right) \left(\frac{V}{C}\right)^{1.85} \quad (6.2)$$

where:

$H$  = Headloss  
 $L$  = Length of pipe  
 $d$  = Internal diameter of pipe  
 $V$  = Flow  
 $C$  = Coefficient



**Demonstration of mathematical operations** It is possible to calculate within L<sup>A</sup>T<sub>E</sub>X. In the process, variables can be used to make it easier to modify.

With values for  $R=0.6\text{m}$ ,  $n=0.013$ ,  $S=0.0025$ , (6.3) will result in  $v=2.736\text{m/s}$ . The user defined macro `\showcalculation` (NDUmacros.tex) is also available for calculations:  $\frac{1.0}{0.013}0.6^{2/3}0.0025^{1/2} = 2.736$

$$v = \frac{1.0}{n} R^{2/3} S^{1/2} \quad (6.3)$$

where:

$v$  = velocity in m/s

$R$  = hydraulic radius in m

$n$  = Manning roughness coefficient (dimensionless)

$S$  = slope of the energy grade line (dimensionless)

**Demonstration of symbols** In TeXstudio instead of viewing the *Structure* in the side panel, click on \* to get a list of symbols. Once inserted a leading and trailing \$ must be placed around the symbol code. Some examples displayed using tabbing:

<code>\$\pm\$</code>	→	$\pm$
<code>\$\Longrightarrow\$</code>	→	$\Longrightarrow$
<code>\$\alpha\$</code>	→	$\alpha$
<code>\$\pi\$</code>	→	$\pi$
<code>\$\mu\$</code>	→	$\mu$

**Demonstration of flowcharts** You can follow the instructions of [overleaf.com](https://www.overleaf.com/learn/latex/LaTeX_Graphics_using_TikZ:_A_Tutorial_for_Beginners_(Part_3)%E2%80%94Creating_Flowcharts) on creating flowcharts, [https://www.overleaf.com/learn/latex/LaTeX\\_Graphics\\_using\\_TikZ:\\_A\\_Tutorial\\_for\\_Beginners\\_\(Part\\_3\)%E2%80%94Creating\\_Flowcharts](https://www.overleaf.com/learn/latex/LaTeX_Graphics_using_TikZ:_A_Tutorial_for_Beginners_(Part_3)%E2%80%94Creating_Flowcharts), to achieve Fig. 6.11 and 6.12.

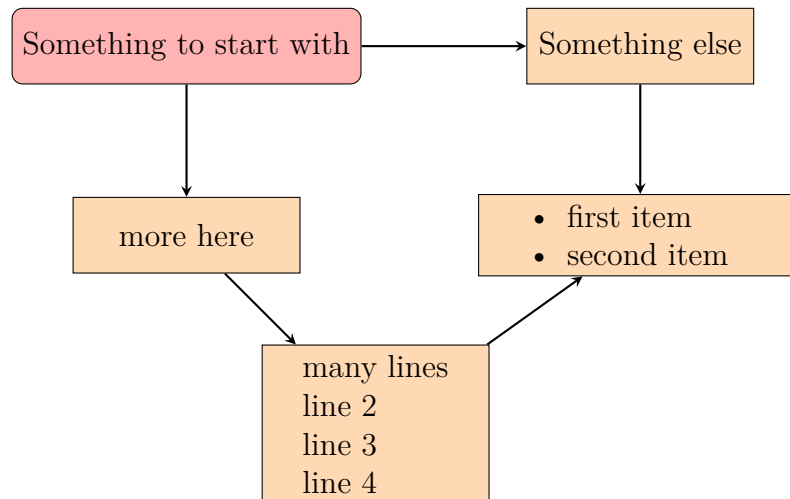


Figure 6.11: Example of a flow chart

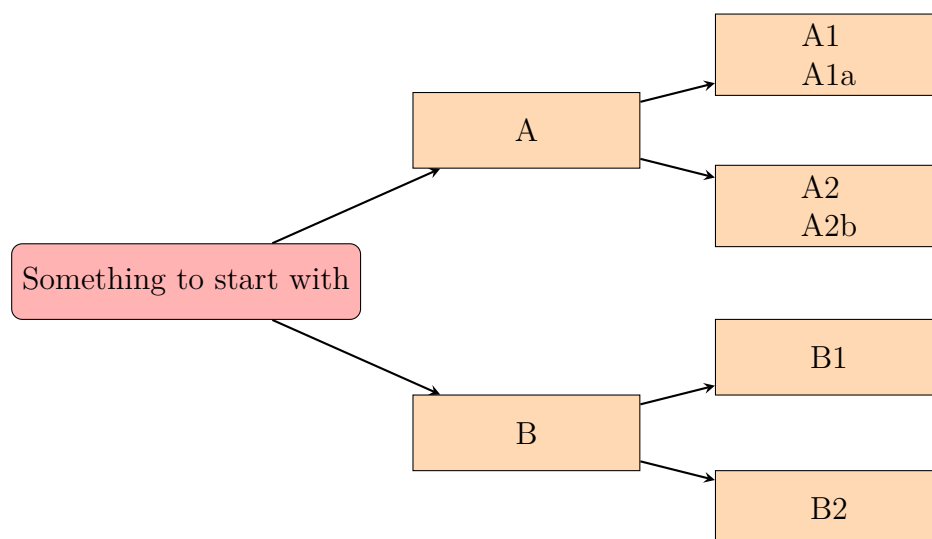


Figure 6.12: Some sort of a tree

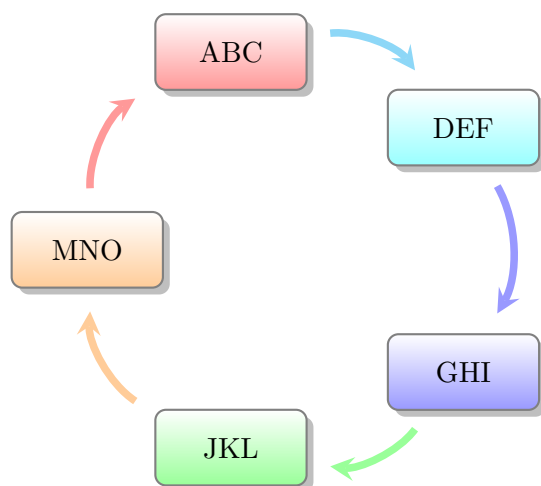


Figure 6.13: Circular diagram

**Demonstration of a circular diagram** There is a number of examples using the smartdiagram package here: <https://texample.net/tikz/examples/all/>. Fig. 6.13 is one of them.

**Demonstration of chemical equations and molecules** Package `mhchem` provides commands for typesetting chemical molecular formulae and equations:



Package `chemfig` supports the drawing of molecules in 2D and 3D. Here is a reaction with the names under the molecules:

