**\*Delete as appropriate**

BACHELOR OF SCIENCE DEGREE / DEGREE WITH HONOURS IN ELECTRICAL ENGINEERING

Senior Design Project Report

Department of Electrical Engineering   
Qatar University

ENTER YOUR PROJECT TITLE

Report by

ENTER YOUR NAME HERE

Supervisor

ENTER YOUR SUPERVISOR NAME HERE

Date

SELECT DATE OF SUBMISSION HERE

# DECLARATION STATEMENT

We, the undersigned students, confirm that the work submitted in this project report is entirely our own and has not been copied from any other source. Any material that has been used from other sources has been properly cited and acknowledged in the report.

We are fully aware that any copying or improper citation of references/sources used in this report will be considered plagiarism, which is a clear violation of the Code of Ethics of Qatar University.

In addition, we have read and understood the legal consequences of committing any violation of the Qatar University’s Code of Ethics.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Student Name** | **Student ID** | **Signature** | **Date** |
| **1** |  |  |  |  |
| **2** |  |  |  |  |
| **3** |  |  |  |  |
| **4** |  |  |  |  |

# ABSTRACT

ENTER YOUR ABSTRACT HERE - The abstract should not be longer than 400 words and is a short summary describing the contents of the report, rather than being a summary of the project. The abstract is not intended to replace any other part of the report e.g. the introduction. It merely provides a taste for what is to come.

# ACKNOWLEDGEMENTS

ENTER YOUR ACKNOWLEDGEMENT HERE - *This section includes thanks to all people who have helped you.*

**TABLE OF CONTENTS**

[DECLARATION STATEMENT i](#_Toc516644037)

[ABSTRACT ii](#_Toc516644038)

[ACKNOWLEDGEMENTS iii](#_Toc516644039)

[LIST OF FIGURES vi](#_Toc516644040)

[LIST OF TABLES viii](#_Toc516644041)

[GLOSSARY ix](#_Toc516644042)

[Chapter 1 Introduction 1](#_Toc516644043)

[1.1 Background 1](#_Toc516644044)

[1.2 Problem Definition 1](#_Toc516644045)

[1.3 Aims and Objectives 2](#_Toc516644046)

[1.4 Design Constraints and Standards 2](#_Toc516644047)

[1.5 Report Organization 3](#_Toc516644048)

[Chapter 2 Literature Review 4](#_Toc516644049)

[2.1 Section Heading 4](#_Toc516644050)

[2.2 Section Heading 4](#_Toc516644051)

[Chapter 3 [Another Chapter] 5](#_Toc516644052)

[3.1 Section Heading 5](#_Toc516644053)

[3.2 Section Heading 5](#_Toc516644054)

[Chapter 4 Design Testing and Validation 6](#_Toc516644055)

[4.1 Section Heading 6](#_Toc516644056)

[4.2 System Limitations 6](#_Toc516644057)

[4.3 Compliance with Design Constraints 6](#_Toc516644058)

[Chapter 5 Conclusion & Future Work 7](#_Toc516644059)

[5.1 Conclusion 7](#_Toc516644060)

[5.2 Recommendations for Future Work 7](#_Toc516644061)

[REFERENCES 8](#_Toc516644062)

[BIBLIOGRAPHY 9](#_Toc516644063)

[Table of contents is automatically generated if you use section headings. Otherwise, create your own table of contents here. To update the Table of contents, Right-click on the TOC area and click Update Fields or Press F9. Ensure that you **do not modify any text** in the TOC area. All modification should be performed in the appropriate chapter/sub-chapter/sub-sub-chapter.]

# LIST OF FIGURES

[Figure 2‑1 This is a sample figure 5](#_Toc523643916)

[List of figures is automatically generated if you use figure captions. Otherwise, create your own list of figures here. To update the List of Figures, Right-click on the LOF area and click Update Fields or Press F9. Ensure that you **do not modify any text** in the LOF area. All modification should be performed in the appropriate caption of the figure.]

# LIST OF TABLES

[Table 1‑1 List of the system constraints 3](#_Toc523644040)

[Table 2‑1 This is a sample table caption. 5](#_Toc523644041)

[Table 4‑1 Compliance with design constraints 7](#_Toc523644042)

[List of tables is automatically generated if you use Table captions. Otherwise, create your own list of tables here. To update the List of Tables, Right-click on the LOF area and click Update Fields or Press F9. Ensure that you **do not modify any text** in the LOF area. All modification should be performed in the appropriate caption of the table.]

# GLOSSARY

[ENTER YOUR GLOSSARY HERE - This section consists of a list of all specialist vocabulary or acronyms with a brief description of their meanings.]

|  |  |
| --- | --- |
| Abbreviation | Description |
| AC | Alternating Current |
| DC | Direct Current |
| DSP | Digital Signal Processing |
| EED | Electrical Engineering Department |
| PWM | Pulse Width Modulation |
| QU | Qatar University |
| RMS | Root Mean Square |

# Introduction

The first page of chapter 1 is designated page 1 of the report such that any pages before chapter 1 can be numbered in formal numbers i.e. i, ii, iii, iv, v, …

## Background

Background information identifies and describes the history and nature of a well-defined design problem with reference to the existing literature. Background information in your Introduction should indicate the root of the design problem being studied, its scope, and the extent to which previous studies have successfully investigated the problem, noting, in particular, where gaps exist that your study attempts to address. Introductory background information differs from a literature review in that it places the design problem in proper context rather than thoroughly examining pertinent literature.

**NOTE:** Research studies cited as part of the background information of your introduction should not include very specific, lengthy explanations. This should be discussed in greater detail in your literature review chapter.

Sufficient background information helps your reader determine if you have a basic understanding of the design problem being investigated and promotes confidence in the overall quality of your analysis and findings. Background information provides the reader with the essential context needed to understand the context of the design problem. Depending on the topic being studied, forms of contextualization may include:

* **Cultural**-- the issue placed within the learned behavior of specific groups of people.
* **Economic**-- of or relating to systems of production and management of material wealth and/or business activities.
* **Historical**-- the time in which something takes place or was created and how that influences how you interpret it.
* **Physical/Space**-- reflects the space around something and how that influences how you see it.
* **Political**-- concerns the political environment in which something is produced indicating it's public purpose or agenda.
* **Social**-- the environment of people that surrounds something's creation or intended audience, reflecting how the people around something use and interpret it.
* **Temporal** -- reflects issues or events of, relating to, or limited by time.

## Problem Definition

After putting your design problem within its general context and highlighting its importance and impacts, you start defining the problem that you intend to solve. The problem definition is what you identify as an issue with supporting data. You should provide evidence and statements about your rationale for wanting to pursue this topic. This is a critical section because it is the backdrop to your design study and supports why it is important.

## Aims and Objectives

Many students find it difficult to understand the difference between aims and objectives. However, in the academic context there is a clear distinction between these terms.

* **Aim**: what you hope to achieve. Aims are statements of intent. They are usually written in broad terms. They set out what you hope to achieve at the end of the project.
* **Objective**: the action(s) you will take in order to achieve the aim. Objectives should be specific statements that define measurable outcomes, e.g. what steps will be taken to achieve the desired outcome.

When writing your objectives try to use strong positive statements:

* **Strong verbs:** collect, construct, classify, develop, devise, measure, produce, revise, select, synthesise
* **Weak verbs**: appreciate, consider, enquire, learn, know, understand, be aware of, appreciate, listen, perceive

Objectives should also be **S.M.A.R.T.** - which means they should be:

* **S**pecific – be precise about what you are going to do
* **M**easurable –you will know when you have reached your goal
* **A**chievable – Don’t attempt too much – a less ambitious but completed objective is better than an over-ambitious one that you cannot possible achieve.
* **R**ealistic – do you have the necessary resources to achieve the objective – time, money, skills, etc.
* **T**ime constrained – determine when each stage needs to be completed. Is there time in your schedule to allow for unexpected delays.

How many aims or objectives should there be?

Please check with your project supervisor. Some supervisors are happy with one clear strong aim, while others like to see a main aim supported by at least two subsidiary aims.

Likewise, there is no fixed number of objectives but you will be required to produce sufficient objectives to be able to measure progress towards meeting the aim/s.

## Design Constraints and Standards

Identify constraints on the design problem, and establish criteria for acceptability and desirability of solutions. Constraints are restrictions that keep something from being the best that it can be. They can be problems that arise or issues that come up. The constraints must be identified through discussions with your project stakeholders (e.g. supervisor, external customers, etc.). This identification must be conducted at the starting of your project. However, some design constraints can be modified in consultation with the stakeholders during the project implementation if they are found unrealistic or very difficult to meet. However, changes must be justified and clearly explained.

When specifying design constraints and standards, it is important to indicate why and how will they apply to your design. Design constraints can be qualitative or quantitative.

ABET listed few examples of possible constraints in its recent criteria as: accessibility, aesthetics, codes, constructability, cost, ergonomics, extensibility, functionality, interoperability, legal considerations, maintainability, manufacturability, marketability, policy, regulations, schedule, standards, sustainability, or usability.

It is highly recommended to use the following table to list the design constraints using the following table:

Table 1‑1 List of the system constraints

|  |  |  |
| --- | --- | --- |
| **Specification** | **Constraint** | **Value** |
|  |  |  |
|  |  |
|  |  |
|  |  |
|  |  |

## Project Plan

In this section, you present a Gantt Chart outlining all of the tasks involved in the project, and their order, shown against a timescale. This gives you an overview of the project tasks, and when these need to be finished.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **#** | **Task** | **Responsibility** | **Weeks** | | | | | | | | | | | | | |
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| **1** | Literature review | Student #1, Students #2 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **2** | Standards and limitations | Student #1, Student #3 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

## Report Organization

In this section, you describe briefly how you organized your report. You start with chapter 2. (e.g. chapter 2 present a literature review about …..; chapter 3 describes the proposed design and the methodology followed to solve the problem of …; chapter 4 validates the proposed design through simulations and experiments; chapter 5 concludes the report and recommends some future work.)

**NOTE:** The main body of the report should typically contain the following sections (please refer to the student handbook for more details about the content of each section):

* Introduction
* Literature review
* Proposed Design Description and Analysis
* Proposed Design Testing and Validation
* Conclusion and future work

Due to the diversity of projects, **students should consult their project supervisor** about the most appropriate structure for their SDPs.

Number all paragraphs but do not use more than three levels e.g. 1.2.4 but not 1.2.4.1. Use alphabets, bullet points, etc. if you feel it is necessary to have further sub-sections.

Chapters may start with an introduction; number all sub-sections but do not use more than three levels e.g. 2.1.4 but not 2.1.4.1. Use alphabets, bullet points, etc… if you feel it is necessary to have further sub-sections.

# Literature Review

## Section Heading

This is where you type your main text. Figures and Tables must have captions associated to them. Use Figure Text or Table text Styles for text formatting in the figures and tables respectively. Please refer to the examples below:



Figure 2‑1 This is a sample figure

Table 2‑1 This is a sample table caption.

|  |  |  |  |
| --- | --- | --- | --- |
| A | B | C | D |
| 1 | 2 | 3 | 4 |
|  |  |  |  |
|  |  |  |  |

[To insert a caption for a picture, Right-Click on the picture and click on Caption, or alternatively, highlight the appropriate picture, select Insert->Reference->Caption. You are advised to use word to automatically generate and manage figure numbers. Otherwise, you’ll end up having to manually adjust figure numbers to match List of Figures.]

All tables, diagrams, charts and graphs must be referenced in the text (using figure numbers) and need to be followed by a caption that briefly describes the table, diagram, chart or graph; the caption should include some form of numbering.

## Section Heading

Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here

# [Another Chapter]

## Section Heading

Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here.

## Section Heading

Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here

# Design Testing and Validation

## Section Heading

In this chapter, you describe how you used simulation and/or experiment to validate your design. You have to clearly describe how you implemented your design and what are all the considerations, assumptions and simplifications you made. You present a selection of your results and discuss them very clearly highlighting how you are validating your proposed design against your initially defined aims.

You can have as many section headings as needed. Nevertheless, keep the last two as follows.

## System Limitations

In this section, you can summarize the limitations of your design based on what you have already presented in the previous sections where you discussed the results obtained.

## Compliance with Design Constraints

In this section, you benchmark your final design characteristics and specifications with the design constraints that you listed in chapter 1. You have to explain and justify any deviation. It is highly recommended to use a table to summarize the above.

Table 4‑1 Compliance with design constraints

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Specification** | **Constraint** | **Value** | **Actual System** | **Practical (If scale down)** |
|  |  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

# Conclusion & Future Work

## Conclusion

Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here.

## Recommendations for Future Work

Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here. Enter your text here.

# REFERENCES

1. Reference 1
2. Reference 2
3. Reference 3

[ENTER YOUR REFERENCES HERE - Information obtained from books, conference and journal papers, or the Internet **must** be referred to in the text using the IEEE referencing style.

References to textbooks should include the author, title, edition number or year, name of publisher and page numbers or section numbers.

Each reference must be referred to at least once in the main body of the report.

References to web pages should include the title of the page, not just the URL.

Students will be penalised if material from published sources is included in their reports without full acknowledgement and attribution of the source of the material.]

# BIBLIOGRAPHY

[ENTER YOUR BIBLIOGRAPHY HERE - Books and other reading matter not specifically referred to in the text but considered useful reading matter should be listed in the Bibliography. The format of the items in the bibliography should be the same as for references i.e. there should be full information to allow a reader to obtain a copy of the text book or journal article.]

1. Appendix Title

[ENTER APPENDICES HERE - Detailed mathematical derivations, component data, software listing and general detailed backup material should be outlined to the appendices. **The appendices should not form the bulk of the report.**

IC manufacturer's data sheets should only be included for unusual devices and even then, only a few relevant pages should be included.]

* 1. Appendix Sub-Heading 1
     1. Appendix Sub-Heading 2