

Appendix I

Proposed report structure ¹⁷

The typical professional mini-project or laboratory report can include up to 15 sections as illustrated in fig. 1. These include a title page or cover page, a table of contents or outline, an objective or abstract, a nomenclature and abbreviations section (if necessary), an introduction that includes an overview of the background theory, and a list of equipment or components used. In addition, the report can contain sections outlining the design methodology, constraints (if any), procedure, results, analysis and discussion of results, answers to questions given in the laboratory manual (if any), experiment or project comments or observations, a conclusion, an appendix, and references. Students should use these 15 items to create checklists they can use to ensure they have included all the necessary sections and information before submitting their reports.

A. Cover Page and Table of Contents

The cover page, a single page, should include the university logo followed by the university, college, and department name. In the upper half of the page, the experiment title and number should appear. In addition, it should include the course code, the course name, section number, and name(s) of the instructor(s). If it is a laboratory report, the title of the experiment should be copied from the laboratory manual, but if it is a mini-project report, the title should provide a concise indication of what was done (maximum two lines). The lower half of the page should contain the student(s) name(s) and ID number(s) as well as the date of the experiment and the due date of the report.

Finally, students must add a declaration to confirm that their manuscripts do not contain plagiarized content, and all students involved in the creation of the reports must sign these declarations. Alternatively, one student can sign on behalf of others as a part of professional responsibility, and this student must inform those who collaborated on the report that he or she will sign on their behalf. The declaration statement is, 'I/We, _____, certify that I/we have neither given nor received any unauthorized aid in this work, and I/we have indicated all references including those from the internet.'

The table of contents typically appears as the second page of a report.

B. Abstract/Objective, Nomenclature, and Introduction

The abstract or objective section provides the first impression of the report. Therefore, students should carefully choose words and phrases to attract the reader's attention and motivate the reviewer to read the body of the report. This short paragraph (not more than 250 words) briefly describes the aim and outcomes of the mini-project or experiment in a concise statement that includes specific information.

It is better to include a section listing the nomenclature and abbreviations after the abstract than to define each symbol in the text. The introduction prepares the reader for the rest of the report. To avoid including irrelevant information, students should limit this section to a maximum of two A4 pages. It should include and justify the importance of the experiment or mini-project. Moreover, it should refer to the relevant theory and important previous studies if appropriate. Students should visit the library to search for information on the background or theory of the subject, or even literature surveys in textbooks or other reference materials. However, students should not copy information from laboratory manuals or other references. They must reference any information taken from other sources, as failure to cite sources leads to plagiarism. As aforementioned students might fall in academic misconduct. In the guidelines the following comments are given to the students ¹⁸.

- All information must be specifically, precisely, and accurately referenced
- Any text or passage quoted word by word should be placed with quotation and the source is accurately referenced.
- Figures, tables, or any other sources must be cited
- For paraphrasing, sources must be accurately cited or acknowledged
- Make sure not to over quote material
- Reference follow IEEE or IET format

C. Equipment or Components Used

The report must contain a list of components and equipment used.

D. Design

Mini-projects might include a design methodology. For some mini-projects, the design process is considered the main part of the report, thus students should ensure that they add design items. These include design requirements, constraints, limitations and assumptions, and trials and modifications as well as realistic constraints, the final design that meets the requirements with any constraints and limitations, design justification and verification, and, finally, the steps or components required to implement and test the functionality of the design.

E. Procedure

This section describes how to perform the experiment in a systematic manner to obtain the required results. Numbering the steps is preferred, as this allows the reader to easily replicate the experiment. Students should redraw rather than scan figures such as electrical circuits, connections, block diagrams, and flowcharts that illustrate the information in the procedure section.

F. Results

This section contains the findings of the experiment. Most experiments yield numerical values or scope figures as results or raw data. It is preferred to present these data in either tables or graphs, or both. Students should distinguish between calculated and measured values where lines or curves can represent calculated or simulated data, but discrete points or marked lines or curves can represent measured data or data calculated from measured values. They should identify these marking signs in the legend^{20,21}. Moreover, it is important to determine axis limits and major and minor ticks and to add a grid (if necessary), axis titles that include units in SI format, and a figure title (if necessary). Figures should include captions when they illustrate practical results. In addition, students should number figures in the order they appear in the text. Similarly, tables should have titles, and students should number them in order throughout the text. For values calculated from measured data, students should detail at least one complete sample of calculation. However, this depends mainly on experiment requirements, as students should add each calculated point for some experiments.

G. Analysis and Discussion of Results

This section is the most important part of the report. Here, students describe, analyze, and interpret the results obtained and present an interpretation of the measured and calculated data. In addition, they draw comparisons between expected and experimental results, determine whether the experimental results align with the expected results, and provide reasons for deviations from the expected results. Furthermore, this part includes simulation results (if required) to confirm the results described in the preceding section. Students should discuss the output from simulations that support the practical results and provide justification if there are any deviations. If required, error analysis appears in this subsection, and from a design perspective, it confirms and adds design verification.

H. Comments and Observations

This section is optional, and its inclusion depends on the instructors' requirements. Nevertheless, it is beneficial to students. During experiments, students record their observation in logbooks. They should document any information provided by instructors or laboratory engineers that supports the experiment or enhances students' technical knowledge of safety precautions, level checks, current monitoring, measurement boundaries, adjusting measurement tools, connection priority, and any abrupt change in any parameter and its effect on the experiment.

To clarify this section, students find in eLearning blog an annotated model depicting an Ohm's law experiment. It lists all the report structure sections in one report to show the students what a professional report looks like. It includes several examples of experiment comments.

I. Conclusion, Appendix, and References.

The conclusion section is a single paragraph that contains the author's overall conclusions relating to the purpose of the study, the significance of the findings, outcomes, usefulness, and advantages or limitations. In addition, it describes the actions that should be taken based on the study results. Like the abstract, the conclusion typically does not contain equations, figures, or references.

The appendix section follows the conclusion and contains data sheets for components as well as additional calculations, software code, graphs, pictures, and tables that were not included in the main body of the report. Each item should be contained in a separate appendix where it should be referenced in the body of the report.

For the reference section, students should use one format such as IEEE or IET. The format depends on the instructor's requirements listed in the laboratory manual or the mini-project statement.

Appendix II

Conducted Experiments for the case study

Course Name and Code	Lab. Number	Experiment Title
Electrical Machines I ECCE4356	1	Electrical Machines Lab. Facilities: Introduction to TERCO and <i>Lab-Volt</i> teaching units
	2	DC Machines: DC generator characteristics
	3	DC Machines: DC motor characteristics
Electrical Machines II ECCE4357	1	Synchronous Generator: No-load and load characteristics of synchronous generator
	2	Specialized Modes of Asynchronous Machine: Unbalanced operation of three-phase induction motor
	3	Special Machines: Single-phase induction motor
Electrical Machines ECCE4358	1	Three-phase Transformer: Phase group and efficiency calculation
	2	Asynchronous Machine: Balanced and unbalanced operation of three-phase induction motor
	3	Special Machines: Single-phase induction motor
Power Electronics and Drives MCTE4210 & ECCE4467	1	Power Electronics Devices and Rectifiers: Single-phase controlled and uncontrolled rectifiers
	2	AC – DC Converter: Single-phase and Three-phase Controlled and Uncontrolled Rectifiers
	3	DC – DC Converter: Class A chopper

The response for each term

Spring 2016	Response	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Response	Response percentage %	
	SD	1	0	0	0	0	1	0	0	1	1	1	0	NA	NA	0	5	1.25	
	D	1	2	1	1	2	2	2	3	6	5	2	2	NA	NA	3	32	7.98	
	N	5	3	2	8	7	3	4	7	4	4	6	2	NA	NA	1	56	13.96	
	A	17	18	17	8	12	15	5	16	14	17	16	12	NA	NA	21	188	46.88	76.78
	SA	7	8	11	13	10	10	20	5	5	4	6	15	NA	NA	6	120	29.9	
No. of answers		31			30	31			30	31			0	0	31	401	100		
Fall 2016	Response	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Response	Response percentage %	
	SD	0	0	0	0	0	0	0	0	1	4	0	0	1	5	0	11	2.23	
	D	0	2	3	2	1	0	0	2	0	8	1	1	7	5	2	34	7.1	
	N	10	7	5	5	6	6	2	9	14	8	12	5	15	8	9	121	25.26	
	A	18	17	16	18	12	15	8	20	16	9	17	19	9	10	19	223	46.6	65.4
	SA	4	6	8	7	12	11	22	1	1	3	2	7	0	4	2	90	18.8	
No. of answers		32			31	32										479	100		
Spring 2017	Response	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Response	Response percentage %	
	SD	0	1	1	0	1	0	2	1	1	0	3	1	0	1	1	13	2.71	
	D	0	2	1	3	1	2	1	1	1	8	0	2	0	1	0	23	4.79	
	N	9	8	6	5	8	8	8	7	12	8	9	3	13	11	2	117	24.4	
	A	17	15	16	17	13	12	4	19	14	13	17	15	15	15	18	220	45.83	68.12
	SA	6	6	8	7	9	10	17	4	4	3	3	11	4	4	11	107	22.3	
No. of answers		32														480	100		
at F	Response	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Response	Response percentage %	

	SD	1	0	0	0	1	1	2	0	1	2	0	1	0	0	2	11	3.1
	D	0	2	3	2	2	0	1	3	3	5	3	1	1	0	0	26	7.22
	N	3	7	6	6	7	5	4	9	10	6	8	5	9	4	8	97	26.94
	A	15	9	12	8	5	13	8	9	9	7	10	11	11	14	13	154	42.78
	SA	5	6	3	8	9	5	9	3	1	4	3	6	3	6	1	72	20
No. of answers		24															360	100
Spring 2018	Response	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Response	Response percentage %
	SD	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0.23
	D	0	0	1	2	0	0	2	4	1	4	0	0	1	0	0	15	3.46
	N	5	6	6	4	5	4	5	7	14	6	8	3	16	7	3	99	22.8
	A	12	17	11	12	11	15	4	15	10	11	17	14	10	15	19	193	44.47
	SA	12	6	10	11	13	10	18	3	3	8	4	12	2	7	7	126	29
No. of answers		29	28	29													434	100

The percentages of responses for each question

	Q1					No. of answers
	SD	D	N	A	SA	
SP 2016	3.23	3.23	16.13	54.84	22.58	31
FL 2016	0	0	31.25	56.25	12.5	32
SP 2017	0	0	28.13	43.13	18.75	32
FL 2017	4.167	0	12.5	62.5	20.83	24
SP 2018	0	0	17.24	41.4	41.4	29
	Q2					No. of answers
	SD	D	N	A	SA	
SP 2016	0	6.45	9.7	58.1	25.8	31
FL 2016	0	6.25	21.9	53.125	18.75	32
SP 2017	3.125	6.25	25	46.87	18.75	32
FL 2017	0	6.25	21.9	37.5	25	24
SP 2018	0	0	20.7	58.62	20.7	29
	Q3					No. of answers
	SD	D	N	A	SA	
SP 2016	0	3.2	6.45	54.84	35.5	31
FL 2016	0	9.4	15.62	50	25	32
SP 2017	3.125	3.13	18.75	50	25	32
FL 2017	0	12.5	25	50	12.5	24
SP 2018	0	3.6	21.42	39.3	35.7	28
	Q4					No. of answers
	SD	D	N	A	SA	
SP 2016	0	3.23	25.81	25.8	41.94	30
FL 2016	0	6.25	15.63	56.25	21.88	32
SP 2017	0	9.4	15.63	53.13	21.88	32
FL 2017	0	8.3	25	33.33	33.33	24
SP 2018	0	6.9	13.8	41.4	37.3	29
	Q5					No. of answers
	SD	D	N	A	SA	
SP 2016	3.23	3.23	16.13	54.84	22.58	31
FL 2016	0	0	31.25	56.25	12.5	32
SP 2017	0	0	28.13	43.13	18.75	32
FL 2017	4.167	0	12.5	62.5	20.83	24
SP 2018	0	0	17.24	41.4	41.4	29
	Q6					No. of answers
	SD	D	N	A	SA	
SP 2016	3.2	6.4	9.7	48.4	32.25	31
FL 2016	0	0	18.75	46.87	34.4	32
SP 2017	0	6.25	25	37.5	31.25	32
FL 2017	4.17	0	20.83	54.2	20.83	24

SP 2018	0	0	13.8	51.72	34.5	29
Q7						No. of answers
	SD	D	N	A	SA	
SP 2016	0	6.45	12.9	16.12	64.52	31
FL 2016	0	0	6.25	25	68.75	32
SP 2017	6.25	3.125	25	12.5	53.13	32
FL 2017	8.3	4.167	16.67	33.33	37.5	24
SP 2018	0	6.9	17.24	13.8	62.1	29
Q8						No. of answers
	SD	D	N	A	SA	
SP 2016	0	9.7	22.6	51.6	16.13	31
FL 2016	0	6.25	28.13	62.5	3.125	32
SP 2017	3.125	3.125	21.88	59.4	12.5	32
FL 2017	0	12.5	37.5	37.5	12.5	24
SP 2018	0	13.8	24.14	51.72	10.34	29
Q9						No. of answers
	SD	D	N	A	SA	
SP 2016	3.33	20	13.33	46.67	16.67	30
FL 2016	3.125	0	43.75	50	3.125	32
SP 2017	3.125	3.125	37.5	43.75	12.5	32
FL 2017	4.167	12.5	41.67	37.5	4.167	24
SP 2018	3.45	3.45	48.3	34.5	10.34	29

Q10						No. of answers
	SD	D	N	A	SA	
SP 2016	3.23	16.13	12.9	54.84	12.9	31
FL 2016	12.5	25	25	28.13	9.4	32
SP 2017	0	25	25	40.63	9.4	32
FL 2017	8.33	20.83	25	19.17	16.67	24
SP 2018	0	13.79	20.7	37.93	27.6	29
Q11						No. of answers
	SD	D	N	A	SA	
SP 2016	3.22	6.45	19.35	51.6	19.4	31
FL 2016	0	3.125	37.5	53.13	6.25	32
SP 2017	9.4	0	28.13	53.13	9.4	32
FL 2017	0	12.5	33.33	41.7	12.5	24
SP 2018	0	0	27.6	58.62	13.8	29
Q12						No. of answers
	SD	D	N	A	SA	
SP 2016	0	6.45	6.45	38.7	48.4	31
FL 2016	0	3.125	15.63	59.4	21.87	32
SP 2017	3.125	6.25	9.4	46.9	34.4	32
FL 2017	4.17	4.17	20.8	45.8	25	24
SP 2018	0	0	10.34	48.3	41.4	29
Q13						No. of answers
	SD	D	N	A	SA	
SP 2016	x	x	x	x	X	NA
FL 2016	3.125	21.875	46.875	28.13	0	32
SP 2017	0	0	40.63	46.875	12.5	32
FL 2017	0	4.17	37.5	45.8	12.5	24
SP 2018	0	3.45	55.17	34.5	6.9	29
Q14						No. of answers
	SD	D	N	A	SA	
SP 2016	X	x	x	x	X	NA
FL 2016	15.6	15.6	25	31.25	12.5	32
SP 2017	3.125	3.125	34.3	46.8	12.5	32
FL 2017	0	0	16.67	58.3	25	24
SP 2018	0	0	24.14	51.72	24.14	29
Q15						No. of answers
	SD	D	N	A	SA	
SP 2016	0	9.7	3.23	67.74	19.35	31
FL 2016	0	6.25	28.125	59.375	6.25	32
SP 2017	3.125	0	6.25	56.25	34.375	32
FL 2017	8.33	0	33.33	51.17	4.17	24

SP 2018	0	0	10.34	65.52	24.14	29
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