REPORT WRITING GUIDELINES

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Report Writing Guidelines

Technical writing is an important task.

This set of notes is intended as a guide as to how to prepare these reports. There is a separate WORD DOC that goes along with this presentation.

Note that individual professors may have different variations of the organization of the material to be provided in a report but the general content is the same.

Report Writing Guidelines

There are several files that are available on the course webpage for reference in either PDF or FLASH format

Report Writing Information with guidelines for generation of technical reports and power point presentation of document

Documentation Guidelines for documenting logbooks and computer files and journals

Formal Report Example - guide of a typical formal report

Memo Report Example - guide of a typical memo report

Logbook Example illustrates a few pages from an experiment

Undergraduate Program Objectives

Undergraduate Program Objectives

Graduates of the undergraduate mechanical engineering program will have:

i. A firm foundation in calculus, physics, and chemistry.
ii. Fundamental knowledge of statics, dynamics, strength of materials, mechanical behavior of materials, electro-mechanics, thermodynamics, fluid mechanics, and heat transfer.
iii. Working knowledge of modern computer aided design, analysis, and manufacturing (CADAM) software
iv. Experience in the application of the integrated application of fundamental principles, CADAM tools, fabrication, and testing techniques to hands-on design-build-test projects.
v. **Proven capability in technical communication skills; written, oral, and graphic.**
vi. The ability to apply the principles developed in the engineering sciences and modern computer aided analysis and design tools to major design and experimental projects, and **to effectively report, both orally and by written reports**, the results of those projects.
vii. A broad exposure to the humanities and social sciences that includes ethics and values.

Undergraduate Program Objectives

Proven capability in technical communication skills; written, oral, and graphic.

…… and to effectively report, both orally and by written reports, the results of those projects.

Report Writing Guidelines

Technical writing is an important but sometimes difficult task for many people.

Two types of reports are generally required for mechanical engineering courses and labs

- *Short memo report*
- *Long format report*

Report Writing Guidelines

The short and long format reports are similar in several respects (discussed later)

First, there are several items that are critical to any technical report to be generated

- *References*
- *Equations*
- *Tables*
- *Plots*
- *Figures*

References

References have the following

- Listed by Author, Publication, date (or other detailed information)
- First reference must start with number 1 (and follow sequentially)
- Reference number is enclosed in bracket [ ]

References - Examples

Reference in text might look like

As stated in Wheeler and Ganji [1], digital sampling must occur greater than twice the maximum frequency of interest when performing the FFT [2]. This is true for frequency domain representations of data. However, the sampling for collecting raw time data must be in excess of 10 to 20 times the maximum frequency of interest [3] when the data to be collected is only to be used for time representations.

and the references at the end would be

References

1. Wheeler, A.J. Ganji, A.R. "Introduction to Engineering Experimentation, 1st Edition, Prentice-Hall, New Jersey, ISBN 0-13-337411-4.
2. Cooley, J.W. & Tukey, J.W., "An Algorithm for Machine Computation of Complex Fourier Series", Math. of Comp., 1965, 19(90), pp 297-301.
3. Avitabile, P., "Basics of Spectrum Analysis/Measurements and the FFT Analyzer", UMASS Lowell Class Notes for ME 22.403, Spectrum Analysis 082702

Equations

Equations should be generated as follows

- Use an equation editor
- Should contain the proper use of superscripts and subscripts and matrix/vector notation
- First equation must start with number 1 (and follow sequentially)
- Equation number is enclosed in ( )
- Equation is on a separate line with equation number to the right

Equations - Examples

$$\sigma^2 = \lim_{T \to \infty} \frac{1}{T} \int_0^{\infty} (x - \bar{x})^2 \, dt = \overline{x^2} - (\bar{x})^2 \tag{1}$$

$$R_{xx}(\tau) = \int_{-\infty}^{+\infty} S_x(f) S_x^{*}(f) e^{j2\pi f t} df \tag{2}$$

$$x(t) = \frac{F_0}{k}\left[1 - \frac{e^{-\zeta \omega_n t}}{m\omega_n \sqrt{1-\zeta^2}}\left(\cos \omega_n \sqrt{1-\zeta^2}\, t - \psi\right)\right] \tag{3}$$

$$\begin{bmatrix} m_{11} & m_{12} \\ m_{21} & m_{22} \end{bmatrix} \begin{Bmatrix} \ddot{x}_1 \\ \ddot{x}_2 \end{Bmatrix} + \begin{bmatrix} k_{11} & k_{12} \\ k_{21} & k_{22} \end{bmatrix} \begin{Bmatrix} x_1 \\ x_2 \end{Bmatrix} = \begin{Bmatrix} 0 \\ 0 \end{Bmatrix} \tag{4}$$

Tables

Tables are constructed as follows

- Generally contains several columns of data
- Usually contains borders or lines separating data
- Table label is ALWAYS at the top
  (not at the bottom)
- Table is referenced BEFORE the actual table appears in the text

Tables - Example

Table 1: Strain Gage Data Collected for Loading and Unloading Beam

Weight	Down mV	Up mV	Down uStrain	Up UStrain
47.8	4.5	7.3	42.37	68.74
147.8	13.0	16.5	122.41	155.37
247.8	22.0	25.6	207.16	241.05
347.8	31.1	34.7	292.84	326.74
447.8	40.1	43.8	377.59	412.43
547.8	49.3	48.4	464.22	455.74
647.8	58.2	58.5	548.02	550.85
747.8	67.2	67.5	632.77	635.59
847.8	76.2	76.5	717.51	720.34
947.8	85.2	85.2	802.26	802.26

Plots and Figures

Plots are an important presentation item

- Plots should always completely stand-alone
- Should be a sufficient amount of material to completely describe the plot
- Reader should be able to interpret most of the plot without having to read the text

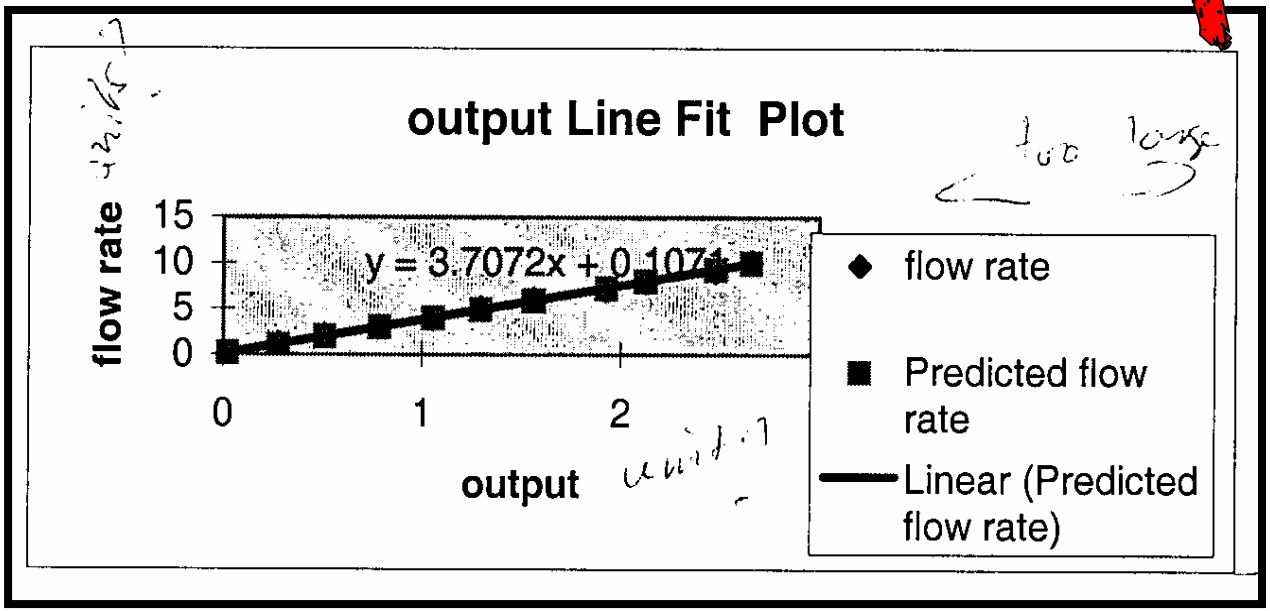
Plots and Figures

Items of a plot that are important

- Must have axes labeled with appropriate units
- Needs a legend if multiple lines exist
- Must have a label to describe the plot
- Scales must have a reasonable numbering scheme
- Printed on a scale to best represent the data
- Should use "white space" effectively

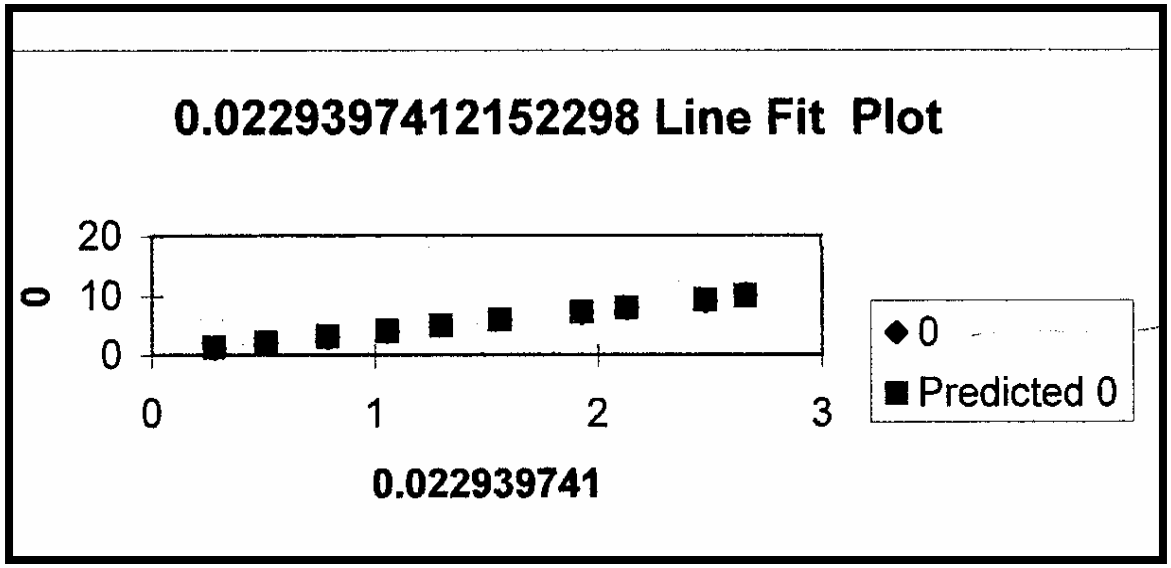
Examples of Poor Plots

-5pts



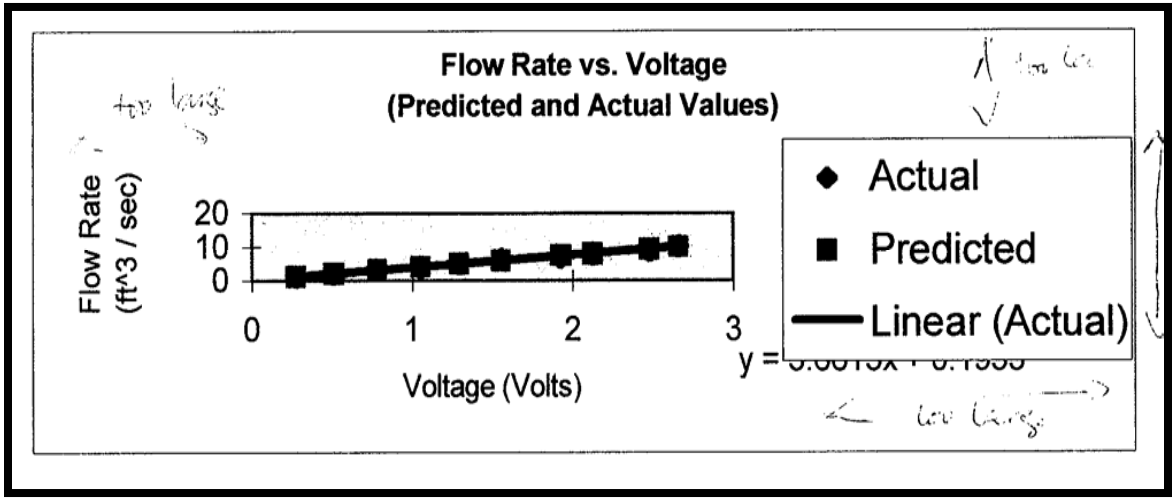
Examples of Poor Plots

-5pts



Examples of Poor Plots

-5pts



Examples of Poor Plots

-5pts

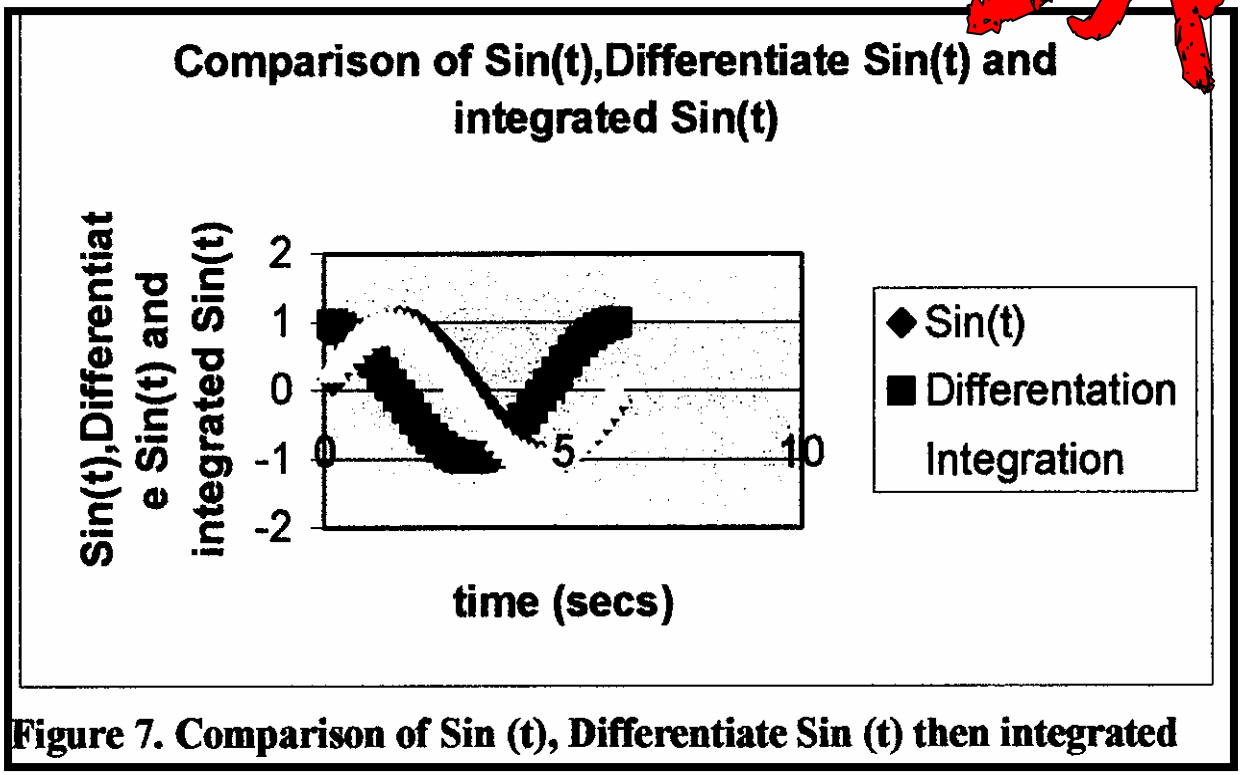
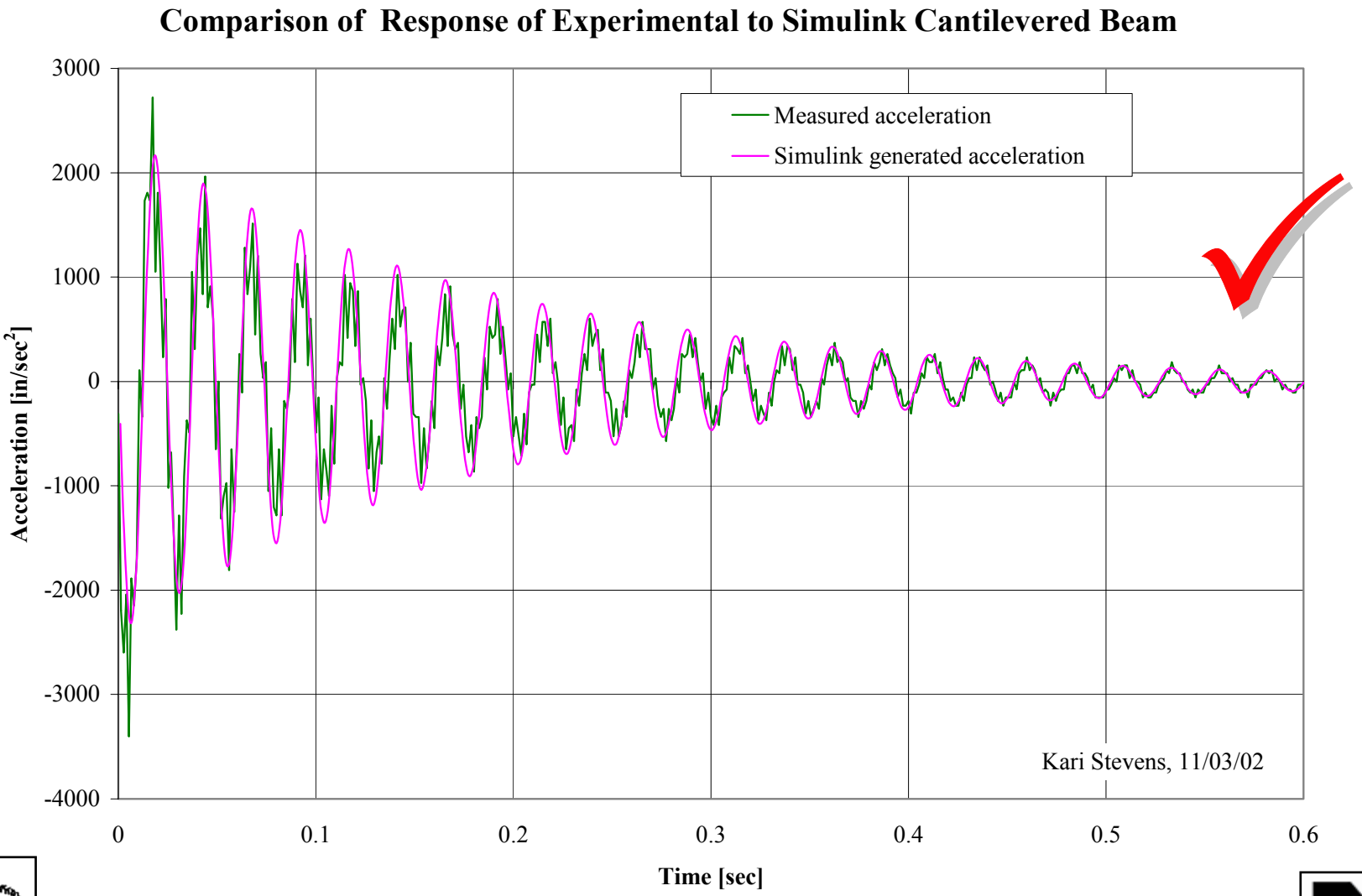


Figure 7. Comparison of Sin (t), Differentiate Sin (t) then integrated

Example of Good Plot



Short Report – Basic Outline

Introduction

Discussion of Procedures or Methods Used

Results Obtained and Analysis Performed

Summary/Conclusions/Recommendations

References

Appendices

Long Report – Basic Outline

Abstract

Table of Contents

Introduction

Theory/Literature Review

Discussion of Procedures or Methods Used

Results Obtained and Analysis Performed

Summary/Conclusions/Recommendations

References

Appendices

Short Report vs Long Report

Short Report

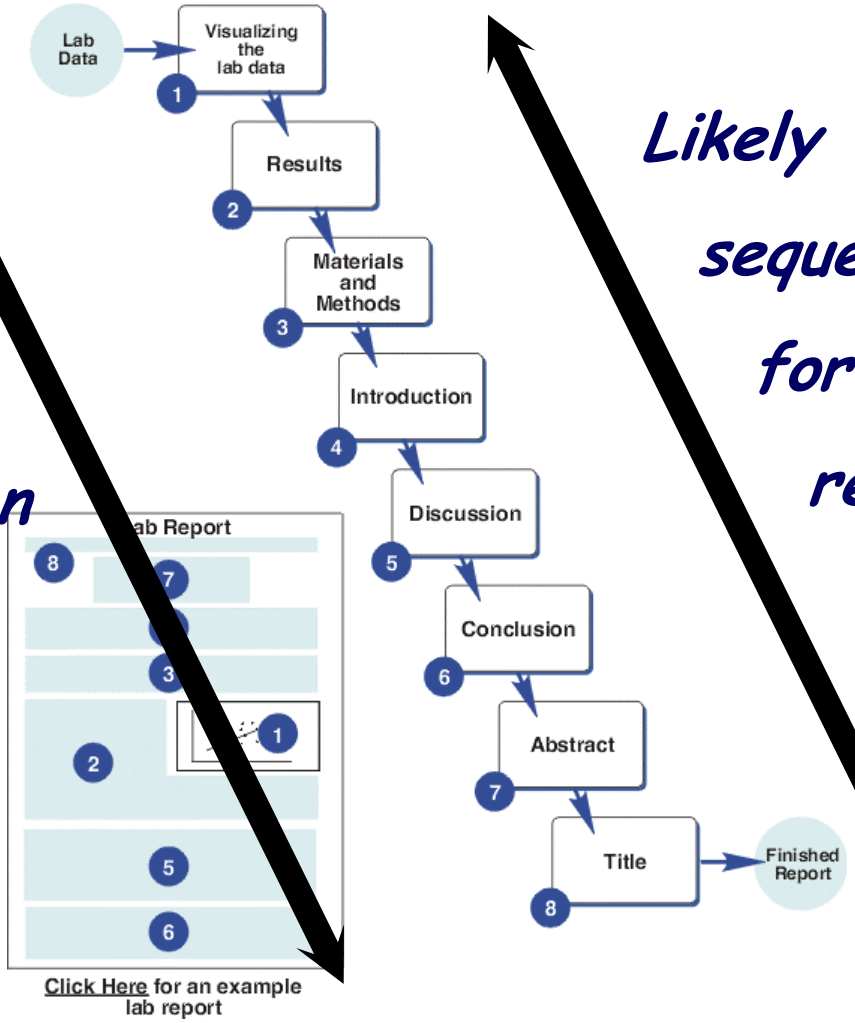
- Introduction
- Discussion of Procedures or Methods Used
- Results Obtained and Analysis Performed
- Summary/Conclusions /Recommendations
- References
- Appendices

Long Report

- Abstract
- Table of Contents
- Introduction
- Theory/Literature Review
- Discussion of Procedures or Methods Used
- Results Obtained and Analysis Performed
- Summary/Conclusions /Recommendations
- References
- Appendices

Report Generation – www.ncsu.edu/labwrite

Likely sequence for the generation of the report



Likely sequence for how the report is actually read

Abstract

The abstract is a summary of the entire project or experiment.

The purpose is to provide readers with a quick condensation, highlighting the important points.

This allows the reader to decide if the particular report is worth reading at the present time.

Note that specific results are not reported in the abstract nor are there any reference to specific references in this section.

Table of Contents

The table of contents lists the various sections of the report in logical order.

This section also contains a list of all figures and tables in the report.

Introduction

The introduction presents the problem at hand.

What is the purpose of analysis or experiment.

Many times the introduction presents what others have done in the area of concern, what has and has not worked well; references to previous work is appropriate in this section.

The introduction leads the reader up to the point of the current work that is being considered to improve, correct or rectify approaches taken by others.

Theory/Literature Review

This section identifies the methodology upon which the analysis or experiment is based.

This may identify the work of others as well as newly developed techniques, approaches or theories.

Discussion of Procedures/Methods Used

This section should briefly describe the approach taken.

There should not be detailed extreme depth in procedures used or analyses performed.

Long excessive detail will generally bore the reader.

This type of detail is best provided in an appendix.

Only the important features of the procedure or method used need be described.

Results Obtained and Analyses Performed

This section identifies the actual results obtained or analyses performed.

Excessive detail should be placed in an appendix.

Only the important information necessary for the reader to understand, in general, what has been observed is necessary.

The details, if needed, can be viewed in the appendix.

Summary/Conclusions/Recommendations

This section may be just the summary or just the conclusions or just the recommendations or combinations thereof.

It depends on the particular report and the end goal of the report.

However, this section(s) must answer questions that were posed in the introduction.

Summary/Conclusions/Recommendations

While summary and conclusion statements are typical in most reports, the recommendations is a critical part of many reports.

The recommendations help the reader to determine what, if anything, should be done in the future to improve on the procedures or methods used.

Another important item is that the Summary/Conclusion should never introduce information that has not been presented in the body of the report.

References/Bibliography

The references and/or bibliography should be complete and follow proper literary formats.

The references need to all be referenced from the main body of the report.

Appendices

The appendices contain logically grouped sections that contain significant detail so the reader can probe further into the data or analyses performed.

The appendices may also contain large sets of tabular data, detailed computer output results, detailed procedures utilized, etc.

Some additional notes

The report should have a footer with the report title, page number and date (or revision)

Discussion of Procedures/Methods Used

The procedures and/or methods used contains exactly that. This section should briefly describe the approach taken. There should not be detailed extreme depth in procedures used or analyses performed. Long excessive detail will generally bore the reader. This type of detail is best provided in an appendix. Only the important features of the procedure or method used need be described.

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Some additional notes

Page numbers start at 1 on the first page and progress sequentially in the report

Appendices have separate page numbers as

- Appendix A has page numbers A1, A2, …
- Appendix B has page numbers B1, B2, …

Some additional notes

Figure/Table numbers start at 1 on the first page and progress sequentially in the report

Appendices have separate numbers

Appendix A has figure and table numbers as
Figure A1, Figure A2, …
Table A1, Table A2, …

Appendix B has figure and table numbers as
Figure B1, Figure B2, …
Table B1, Table B2, …

Some additional notes

Equations in a report are generally on a separate line and are either left justified and tab indented or centered on the line; the equation number is right justified with equation number in ( )

EQUATIONS

Equations should be prepared with an Equation Editor and should contain the proper use of superscripts and subscripts and matrix/vector notation as needed. In the text, the equations should be numbered, starting with the number 1, when referenced and enclosed in parentheses ( ). The equation itself should generally be on a separate line with the equation number to the right of the equation (and preferably right justified). Some examples of equations are shown below for reference.

$$x(t) = \frac{F_0}{k}\left[1 - \frac{e^{-\zeta\omega_n t}}{m\omega_n\sqrt{1-\zeta^2}}\left(\cos\omega_n\sqrt{1-\zeta^2}\,t - \psi\right)\right] \qquad (1)$$

Some additional notes

Tables are referenced at the top of the table

TABLES

Tables are an orderly, organized presentation of data. The table will generally contain several columns of data that is organized with a label at the top of each column. Although not necessary, the table may contain borders and lines separating various parts of the data. A table label is always presented at the top of the table – not at the bottom. Tables are referenced in the main body of the document before the table is reached in the document. A sample table is shown below.

Table 1: Strain Gage Data Collected for Loading and Unloading Beam

Weight	Down mV	Up mV	Down uStrain	Up UStrain
47.8	4.5	7.3	42.37	68.74
147.8	13.0	16.5	122.41	155.37
247.8	22.0	25.6	207.16	241.05
347.8	31.1	34.7	292.84	326.74
447.8	40.1	43.8	377.59	412.43
547.8	49.3	48.4	464.22	455.74
647.8	58.2	58.5	548.02	550.85
747.8	67.2	67.5	632.77	635.59
847.8	76.2	76.5	717.51	720.34
947.8	85.2	85.2	802.26	802.26

Some additional notes

Figures are referenced at the bottom of the table

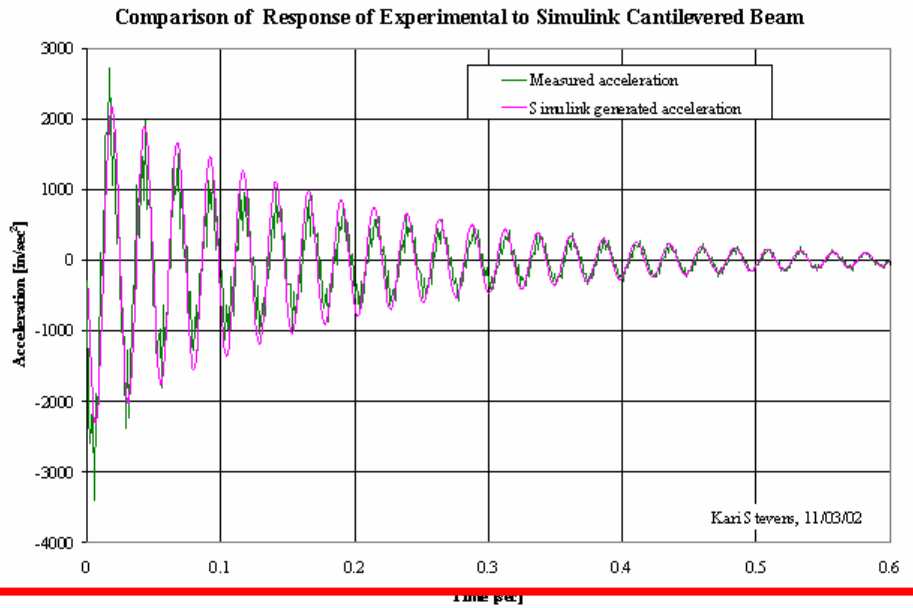
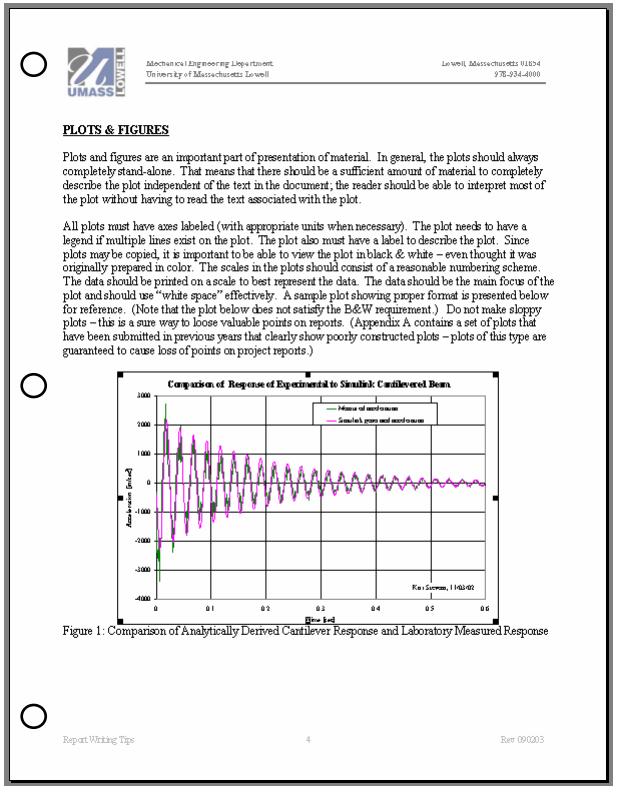


Figure 1: Comparison of Analytically Derived Cantilever Response and Laboratory Measured Response

Orientation of Figure in Report

Portrait Orientation vs Landscape Orientation



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PLOTS & FIGURES

Plots and figures are an important part of presentation of material. In general, the plots should always completely stand-alone. That means that there should be a sufficient amount of material to completely describe the plot independent of the text in the document; the reader should be able to interpret most of the plot without having to read the text associated with the plot.

All plots must have axes labeled (with appropriate units when necessary). The plot needs to have a legend if multiple lines exist on the plot. The plot also must have a label to describe the plot. Since plots may be copied, it is important to be able to view the plot in black & white – even thought it was originally prepared in color. The scales in the plots should consist of a reasonable numbering scheme. The data should be printed on a scale to best represent the data. The data should be the main focus of the plot and should use "white space" effectively. A sample plot showing proper format is presented below for reference. (Note that the plot below does not satisfy the B&W requirement.) Do not make sloppy plots – this is a sure way to loose valuable points on reports. (Appendix A contains a set of plots that have been submitted in previous years that clearly show poorly constructed plots – plots of this type are guaranteed to cause loss of points on project reports.)

Figure 1: Comparison of Analytically Derived Cantilever Response and Laboratory Measured Response

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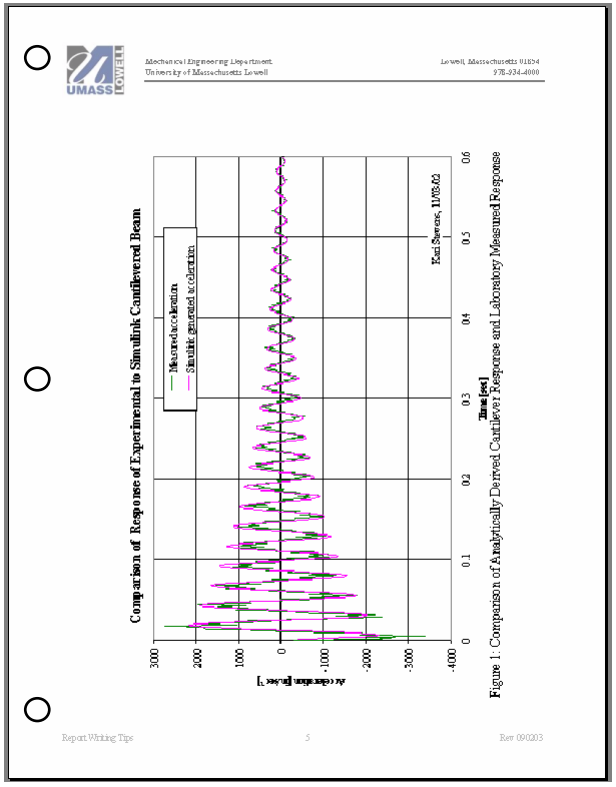

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Figure 1: Comparison of Analytically Derived Cantilever Response and Laboratory Measured Response

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Spellchecker – Your best friend

Word processors have spell-checkers built in

USE IT

Misspelled words are very annoying when reviewing a report and there is no reason to not spell-check your document

Editorial Blunders

There are many, many common editorial blunders that many people often make in writing reports.

The WORD DOC that goes along with this presentation has information that is too lengthy to list here.

Review this list to be sure that you don't fall into the common mistakes typically made.