ME 195 – Senior Design Project

Writing Professional Technical Reports

Presented by: Dr. Winncy Du

October 3, 2018

Mechanical Engineering Department
San Jose State University
San Jose, CA

Importance

(5%) Project proposal and progress reports

(25%) Delivery of at least three presentations on achievements and timely progress

(15%) Individual writing assignments

(40%) Final report

(15%) Individual performance evaluation

Outlines

Report Structure
Common Mistakes
Proofreading Checklist

The Report Structure

1. Title Page
2. Abstract/Executive Summary
3. Table of Contents
4. Introduction
5. Theory
6. Design
7. Testing, Results and Discussion
8. Conclusions and Future work
9. References
10. Appendices

1. Title Page

Title Page: Includes

- Project Title
- Authors' Name
- Course name, number, and section
- Instructor's name
- Date
- University and department affiliation

1. Title Page (continued)

How to Choose a Project Title:

The Project title should be short, meaningful, informative and indicative of the project contents

Good Title:

A Motorcycle Design with the Spherical Wheels and Three Point Driving Mechanism

Spartan Unmanned Fishing Vessel

Bad Titles:

Spartan Vessel

2. Abstract/Executive Summary

Abstract/Executive Summary is first thing in the report, but always written last, after the project has been completed.

Both give reader the summary of why (the needs, objectives), how (methodology, assumption, design), conclusions (test results and findings)

Abstract:

- One paragraph, less than half-page length (some has the word limit (most require < 150 words)
- Single-line spacing
- Third person narrative

Executive Summary

- Miniature document, multiple paragraphs, one to two pages
- Describes the Why Written in third person narrative
- Has an easily readable format (line spacing and fonts)
- Intended to give a descriptive overview of the project
- Often has a figure.

“Abstract” by Students

To reduce errors in the assembly of the BSC IntraVascular UltraSound (IVUS) Isight catheter telescope assembly. The obstacles are to contact the BSC manager, implement a vision system to locate randomly oriented parts, and create a user-friendly interface with LabVIEW (as requested by BSC),… to satisfy the project objectives.

The scope of this project is the automation of the manufacturing …

The goal of this project is to provide BSC with the best assembly method for automating the catheter manufacturing assembly line along with a tangible proof-of-concept demonstration assembly system.

Abstract by Students

A half-scale proof of concept for a new model support system at NASA is implemented. The feedback control for a tilt table angle of attack, as well as a way of removing it completely from the stream. The … design provides the necessary force to each cylinder. Fine control over the tilt cylinder is achieved by incorporating a proportional control valve and an electro-pneumatic pressure regulator. The Compact DAQ controller provides input to the four pneumatic control valves with closed-loop feedback (PI) control on the proportional valve via a quadrature encoder position read-out. The overall system performance results in steady state error of 0.05, rise time of 0.10 seconds, settling time of 2.32 seconds and percent overshoot of 19 percent.

3. Table of Contents

- Table of contents
- List of Tables (>3)
- List of Figures (>3)

4. Introduction

- Background information of the project (description of the problem and reasons for the work being done)
- Objectives of the project
- Thorough literature review
- Work carried out in the project
- Specifications
- Each team member's role
- Timeline

Specifications

An explicit set of requirements to be met by your final device. dimensions, materials, functionalities, etc. Example:

Mechanical System

- Pressure 60 psi.
- Minimum/Maximum tilt angle (angle of attack): -8° to +8°
- Payload 600 N.

Control System

- Minimum/Maximum insertion and retraction time = 1 s./999 s
- Rise time = 0.2s
- Minimum actuation speed = 1°/s or 2 in./s

5. Theory Background

- Described the theory being used: Formulae, equations, hypotheses, etc.
- Provide references of the original source
- Include only the necessary and sufficient mathematics in the text, rest in the Appendix
- The theory section ascertains that your project is based on the advanced engineering concepts

6. Design and Simulation

This section will depend on the type of project being done. For design projects:

- Match your specifications
- Description of preliminary design and the steps leading to the final design
- Reasons for the selection of parts, material, processes, etc.
- Governing theories, formulae, equations, etc.
- In the appendix, provide:
  - Simulation
  - A compete list of Bill of Materials
  - Detailed parts-drawings and vendor catalog

7. Testing, Results and Analyses

8. Conclusions & Future Work

- Remind the reader of what you were trying to achieve
- Tie together the theory, method, results, and discussion project
- Meet expectations?
- State which works, which doesn't work
- Summarize the features, functions, and performance of the final device
- Project to different scale or extension

Good "Conclusion" Example

- The Capacitive Sensor Lab Station has met all of the design requirements except for two of them: the ability to adjust the permittivity and a separate test chamber.
- Both the bottom and top MSA are able to accurately move the plates.
- The system is also able to measure all the properties -- capacitance, temperature, pressure, etc. -- with ±0.3 pF, ±0.5 ^{o}C, and 0.05 Pa accuracy.
- The user interface was able to provide the user with the ability to plot and save the data which they desired.
- The initial results obtained from the testbed agree with the theory of a parallel plate capacitor. For the effective area overlap, the testbed shows a linear relation with respect to capacitance. With plate separation, the testbed shows an inverse relation with respect to capacitance.

Bad "Conclusion" Example

- This project is interesting, fun and sexy.
- We purchased 34 motors, 15 gears, and 6 microcontrollers to build this very complex robot.
- The original budget was projected at approximately five thousand dollars. XXX agreed to fund the entire prototype.
- Teamwork provides the ability to brainstorm on how to solve different issues, and allows different engineering backgrounds to be involved.

9. References

1. Journal articles
2. Books
3. Web sites

References

- A journal paper that you have cited in the text:

  *Babuška, Ivo; Banerjee, Uday; Osborn, John E. (June 2004). "Generalized Finite Element Methods: Main Ideas, Results, and Perspective". International Journal of Computational Methods **1** (1): 67–103*

- Referencing a book you have used:

  Reddy, J.N. (2005). An Introduction to the Finite Element Method (Third ed.). McGraw-Hill. ISBN 9780071267618

- Referencing a web site:

  Finite Element Methods. Retrieved from Wikipedia 10/1/2018:
  http://en.wikipedia.org/wiki/Finite_element_method

10. Appendices

Include the useful information that was too lengthy to include in the main body

- Sample calculations
- Raw data
- Detailed drawings
- Bill of Materials
- Vendor brochure/datasheet

Any item included in the Appendix must be referenced in the report.

Numerals vs. Spell Out Numbers

Use Numerals (1, 2, 3…)

- Numbers larger than nine
- When the number is connected to a unit of measure
  (3 lbs, 5 Volts, 2 sq. ft.)

- Decimal and fractional numbers greater than one.
  (1.5)
- A combination of numerals and words for very large numbers (especially in money)
  (The light rail system in San Jose has cost over $6 billion.)

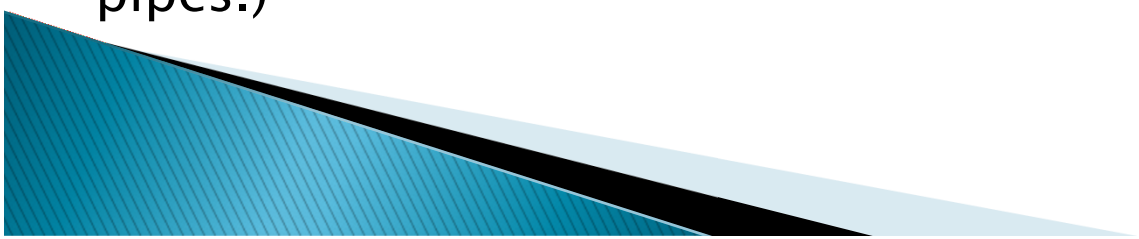
Numerals vs. Spell Out Numbers

Spell Out Numbers

- A number beginning a sentence
- Numbers less than 10

Exception: when contain larger numbers referring to the same units:
(We have two departments with 3 computers in one and 17 in the other.)

- Very round numbers
  (About a thousand units have been ordered.)
- Prevent misreading
  (We ordered **eleven** 8-foot pipes.) ↔(We ordered 11 8-foot pipes.)



Quotations Using APA Format

APA - **A**merican **P**sychological **A**ssociation

When not a direct quote

- Jones compared the performance spherical wheels ... (Jones, 2011)

  Jones compared the performance spherical wheels ... [1]

- The new iphone will exceed expectations regarding… ("Introducing iPhone," 2010).

  Introducing iPhone. (n.d.). Retrieved March 3, 2010, from ATEC web site: www.atec.com/products.php

When using the exact words

- If ≤ 40 words, use double quotation marks: “xxx”

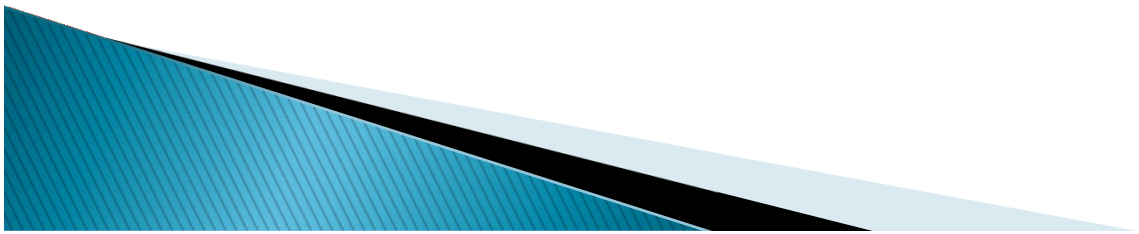
  She said, "Students often had difficulty using APA style," (Smith, 2007, **p. 199**).

- If > 40 words (Long Quotations/Block Quotes), use a free-standing block of typewritten lines w/o quotation marks
  - In double spacing report, start the quotation on a new line, indented **5 spaces** from the left margin. Type the entire quotation in single spacing.

The following explains the procedure:

> Students often had difficulty using APA style, especially when it was their first time citing sources. This difficulty …. (Jones, 2007, p. 199)

  - In single spacing report, start the quotation on a new line indented **10 spaces** from the left margin. Maintain single spacing throughout.



Common APA Formatted Reference

Wiki (Wikipedia)

Tsunami. (n.d.) Retrieved March 20, 2011, from http://en.wikipedia.org/wiki/Tsunami.

Journal Articles

Linsdell, J., & Anagnos, T. (2011) Technical Writing, *Journal of Professional Issues in Engineering Education and Practice*, ASCE, V137, 20-27.

Books

Wright, R. T. & Nebel, B. J. (2008). *Environmental Science: Toward A Sustainable Future*, (10th ed.). Prentice Hall.

Blog

Last name, First Initial. *Title of individual blog entry*. Retrieved November 1, 2011, from http://www.blog.com

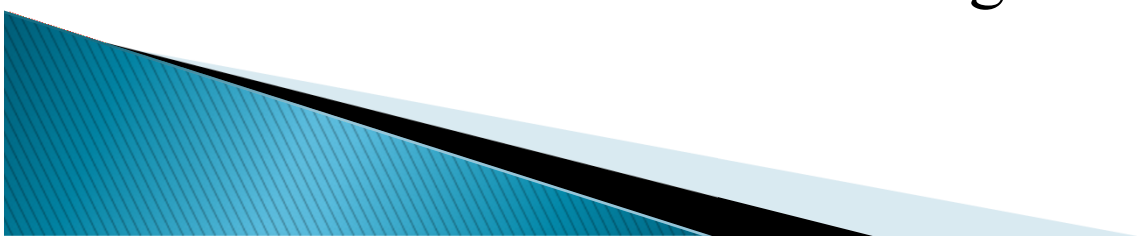
Sources (e.g., data from a published table/figure)

Tables and Figures

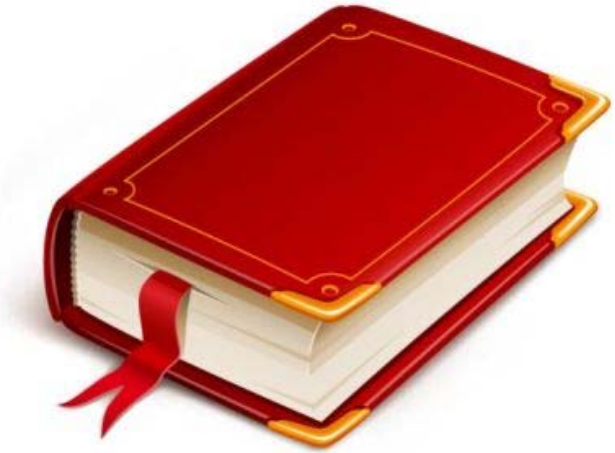
- Sequence:
  - Tables of Contents
  - List of Tables (≥3)
  - List of Figures (≥3)
  - List of Equations (≥3)

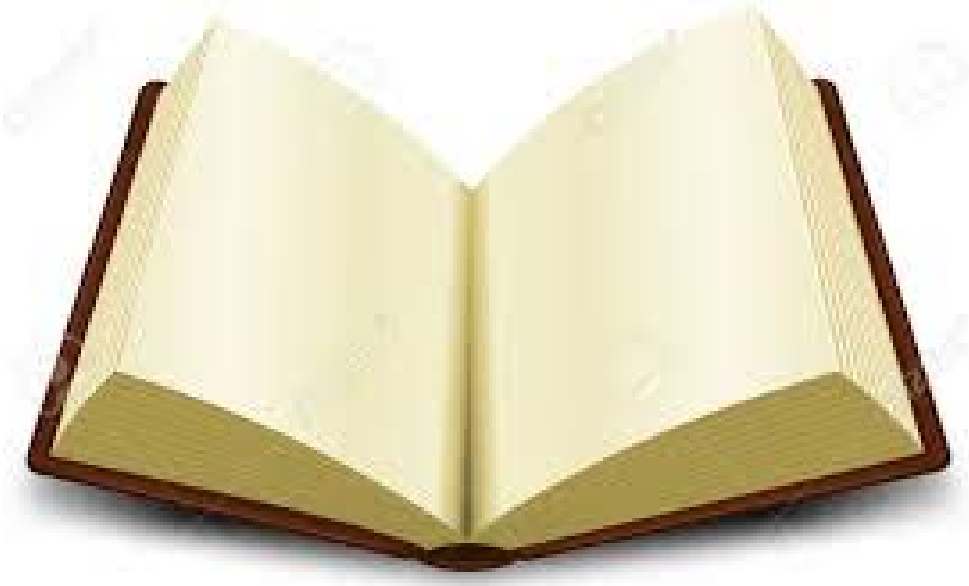
- Arabic Numerals (1, 2, 3, ...)
  - A table's number and title: above the table (e.g., Table 1.1 or Table 1)
  - A figure's number and title: beneath the figure (e.g., Figure 2.5 or Figure 8)

- Orientation of Tables and Figures: Up-Left Rule



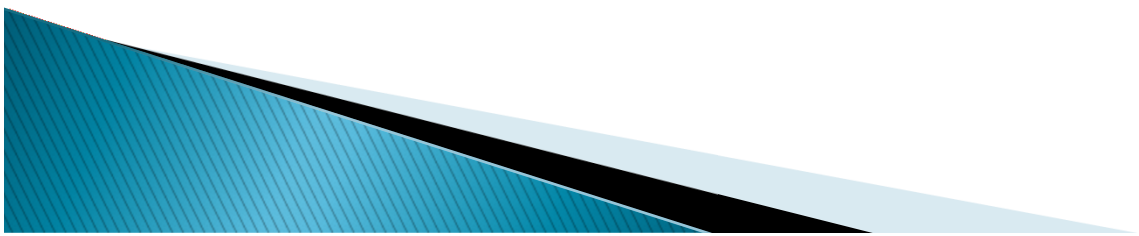
Up-Left Rule





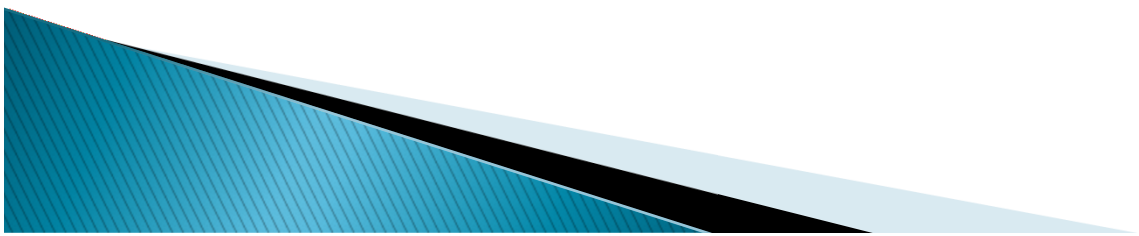
Common Mistakes

- Using first-person narrative
- Using present tense
- Inconsistent
- Non-smooth transition
- No explanation on figures or tables
- No sources
- No units
  - Temperature units (^oF, ^oC, ^oR, K)
- No optimization
- No equations or calculations
- No enough theoretical background
- No thorough literature reviews



Final Writing Checklist

- Organization, Length/Balance
- Contents
- Grammar and Syntax
  - period
- Visuals
  - Section numbers
  - Tables
  - Figures
  - Page numbers
  - Fonts (12 point -- industry standard).
  - Capital



Start to write
your final ME195A&B
report right now!!!

See the report writing Outline and timeline and guideline at:
http://www.sjsu.edu/me/programs/bsme/bsme_seniorproject/ME195AB_Report_Writing_Outline_and_Timeline.pdf

Thank you