Project 1 Report:
A Quick Guide

REVISED JANUARY 9

** For a comprehensive list of requirements, read through the report rubric and the handouts you got from your 223 instructors.*

Purpose of Project 1 Report

- Present and analyze several of your design alternatives
- Outline the strategy that you adopted for the competition, and show how the mechanisms and design features you used relate to that strategy
- **Provide a recommendation (with justification) based on the work you've done and what you witnessed in the competition**

Requirements

- Doubled-spaced, 12-point Times New Roman font (for general body text; see rubric for additional text requirements), professional presentation
- Max 2500 words (approx. 10 pages of double-spaced text), not including illustrations, front matter, or end matter
- Appendices: max 2000 additional words
- Due at the Mech Office (CEME 2054) no later than 9:00 am on Monday, January 29.

Letter of Transmittal *(not bound)*

Title Page
Table of Contents
List of Tables and Figures
Abstract

FRONT MATTER

Introduction
Strategy
Functional Decomposition
Conceptual Solutions
Evaluation
Final prototype and competition results
Recommendations
Conclusion

MAIN TEXT

Appendices
Glossary
References (if applicable)

END MATTER

Letter of Transmittal

- You will submit 2 printed copies of your report, each with a different letter of transmittal
  - One will be addressed to me; the other will be addressed to your 223 instructors
- Include the date, a clear subject line, a proper salutation, team contact information, and signatures of all team members
- State title of report and purpose
- Limit to 1 page, single spaced
- Do not attach to the report (should be loose page inside front cover)

Example: Letter of Transmittal

Marine Drive Residence,
[redacted] 2205 Lower Mall,
Vancouver, BC, V6T 1Z4

January 28th, 2017

Ms. Adriana Eyking
MECH 226 Instructor
2329 West Mall,
Vancouver, BC, V6T 1Z4

Dear Ms. Eyking:

We respectfully present you with our formal recommendation and report, entitled "Titan Endurance Design Recommendations". We submit this report to explain our team's design process and justify our design decisions, in addition to proposing the best solution for this project.

We thank you for taking the time to read this report and for considering our recommendations for the Titan Endurance project. We would be pleased to be in contact with you to address the content of the report or any questions you may have, via [redacted] at [redacted]@hotmail.com.

Respectfully submitted,

Signatures redacted

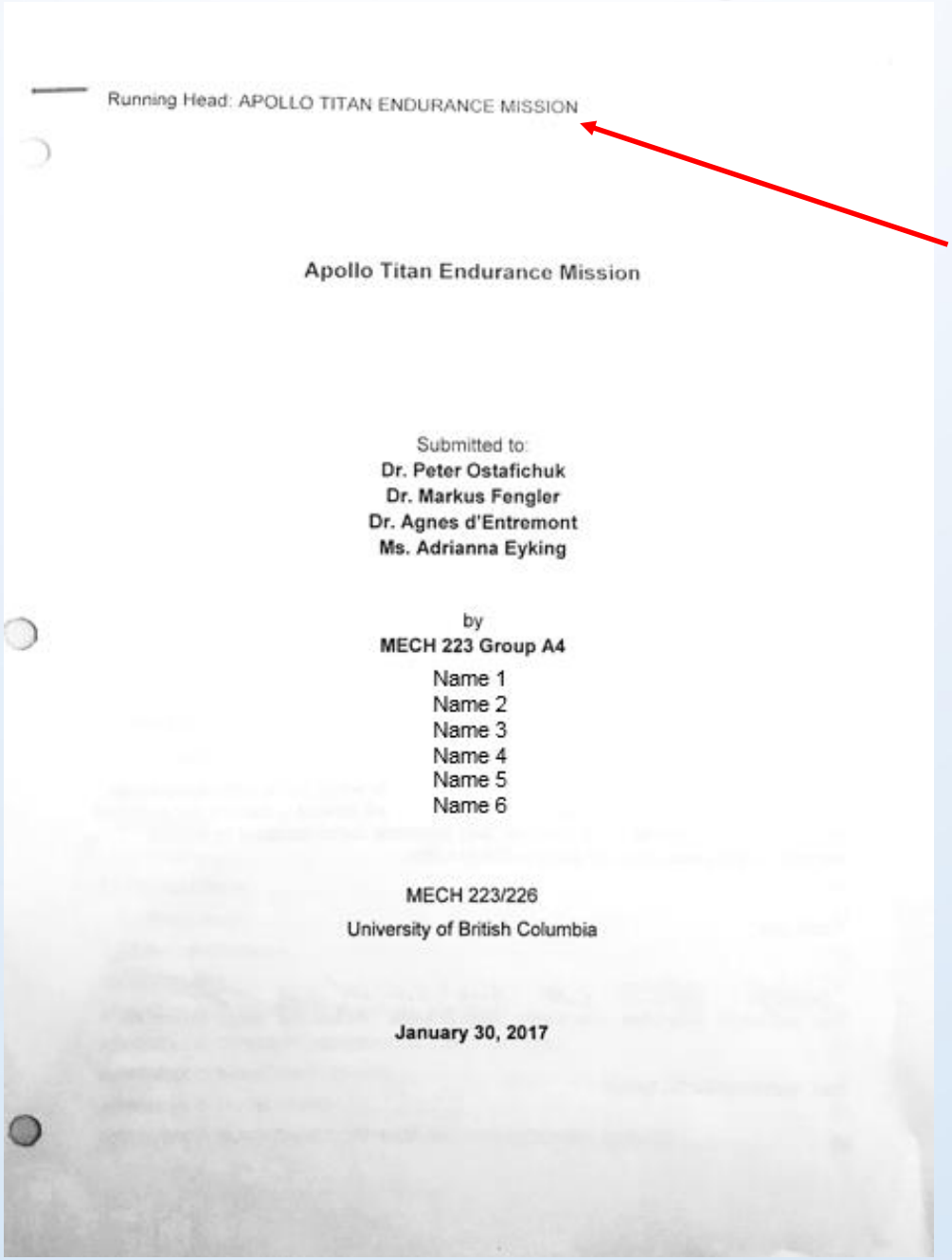
Names redacted

* Please note that this is just one example. It is formatted properly but the text isn't perfect (as you can see from corrections)

Title Page

- The title page should include:
  - Running head
  - Title of the report (use a descriptive title!)
  - Names of authors
  - Names and affiliations of recipients
  - Submission date
- It is the only page (other than the Letter of Transmittal) that does not have a page number in the top right corner

Example: Title Page



Running Head: APOLLO TITAN ENDURANCE MISSION

Apollo Titan Endurance Mission

Submitted to:
Dr. Peter Ostafichuk
Dr. Markus Fengler
Dr. Agnes d'Entremont
Ms. Adrianna Eyking

by
MECH 223 Group A4
Name 1
Name 2
Name 3
Name 4
Name 5
Name 6

MECH 223/226
University of British Columbia

January 30, 2017

Note: Running Head on the title page should say "Running Head: TITLE" (as you see here). Later pages should just say the title.

Table of Contents

- Ensure that titles and headings in the Table of Contents are **identical** to those within the report
  - This is why proofreading is so important!!!
- Do not include Title Page or Table of Contents as entries
- Number front matter with lowercase Roman numerals starting at iii (see next slide), and everything else with Arabic numerals starting at 1.
- Include subdivisions within sections
  - Use different font sizes and/or indentation to differentiate levels of headings
- Make sure structure of headings is parallel (physically and grammatically)

Example: Table of Contents

TABLE OF CONTENTS

Should be no gap here

Glossary should go after Appendices and should not be numbered

Title Page and ToC: A Clarification

- The Title Page is page i, but the page does **not** show the number and it is **not** included in the Table of Contents
- The Table of Contents page is page ii, and **does** have the page number on it, but it is **not** an entry in the list
- The ToC list will therefore start at iii (List of Tables and Figures)

List of Tables and Figures

- List tables, graphs, charts, and all other visuals
- All items should be numbered and titled. Number appendix tables/figures as follows:
  - The first table in Appendix A is Table A1; the first figure is Figure A1; the second table is Table A2
  - The first table in Appendix B is Table B1; the first figure is Figure B1; the second table is Table B2…
- Again: Proofread to ensure that titles and headings in the list are **identical** to those within the report
- Make sure structure is consistent

Example: List of Tables and Figures

LIST OF TABLES AND FIGURES

new page for LoF+L

Items in report body

Items in appendices

Example: List of Tables and Figures

LIST OF FIGURES

LIST OF APPENDIX FIGURES

LIST OF APPENDIX TABLES

This person has chosen to separate (with headings) items in the body from items in the appendices. You can choose to do it either this way or like it's done on the previous slide (both are correct).

Abstract

- For this report, use an “executive abstract” (includes recommendations)
- Should be no longer than 1 page
- Summarize the report without adding new information
  - Why the report was written (the problem)
  - How you researched it (methods)
  - Major findings (results)
  - Your recommendations and conclusions

Introduction

- No longer than a page
- Provide purpose, context, significance, scope and methodology, but not findings
- End with list of the sections that follow
- Since there is a common project for the whole class, give only a brief orientation to the main purpose of the competition
- Try not to just narrate the process as it unfolded
  - e.g. “The class was assigned a project… We proceeded to brainstorm solutions… We then did X… after we finished X, we did Y….

Body

- All sections should have an opening and concluding statement, and should transition smoothly from one to the next
- The body of this report should contain the following sections:
  - Strategy
  - Functional Decomposition
  - Conceptual Solutions
  - Evaluation
  - Final prototype and competition results
  - Recommendations

Strategy

- Describe the strategy you used to meet the competition requirements
  - What choices did you make about how to approach the project?
  - How were these choices linked to your assessment of the scoring system?
  - What tradeoffs did you have to make, and why were they (or why did you think they would be) worth it?
- Focus on the aspects that make your approach to the design problem unique
  - Don’t spend time discussing the detailed goals of the competition in depth, but do make clear the link between your strategy and the competition goals.

Functional Decomposition

- Describe the functions required to complete the project missions independent of your specific solution
  - You should have between 6 and 10 top-level functions
- Roughly arrange each of these functions from most to least deterministic
- Note: You will include a function structure diagram in the appendix so you don't need to include one in this section, but you must tell your reader that the complete diagram is in the appendix (and specify which appendix, so they know where to look for it).

Conceptual Solutions

- Present a brief technical description of each of the key conceptual solutions that you considered, including the final concept you used and a variety of your most creative or promising alternatives
- You will describe all of your conceptual solutions in an appendix but only include descriptions in the report body for 3-4
  - It should be clear why you have chosen those specific 3 or 4 to include; don't just pick a random selection
- You are strongly encouraged to use figures to illustrate each concept

A Note on Conceptual Solutions

What your 223 instructors want to know:

- How many, and how broad a range they were (so include brief descriptions of all* solutions in the appendix)
- Detailed descriptions of the best ones (in the main report text)

* Note: Limit what you include to things that are at least sort of in the realm of possibility (i.e. if you wouldn't spend time presenting your boss with a concept that uses nuclear power to open a wine bottle, don't put it in the report or the appendix).

A Note on Conceptual Solutions

A good example from your 223 instructors:*

"We developed 26 concepts using [major system options], of which 19 were eliminated through Winnowing (see Appendix A.1 [shows or describes the concepts really briefly as well as why they were each eliminated]). The remaining 7 concepts were ranked, and 3 of them consistently ranked highly (see Pugh charts in Appendix A.2). These three concepts ([list them]) are shown in Figure 2. [Provide brief description of them.] We completed a WDM to determine which of these three concepts to move forward with (see Appendix A.3). The WDM analysis was inconclusive, due to uncertainty in [whatever factor]. As a result, we moved forward with all three concepts."

**Note that this is just one way to approach this, not the only way!*

** Do NOT copy this word-for-word for your report, as that is plagiarism!*

Evaluation

- Briefly outline your evaluation, screening, and scoring approaches and justify the concept that you chose to develop
- Highlight the specific tools and outcomes you used to objectively support your design decisions (don’t just list a sequence of generic processes)
- Place detailed analysis, calculations, Pugh Charts, Weighted Decision Matrices, prototyping analysis, and so on in the Appendices (and refer the reader to them).

Final Prototype and Competition Results

- Provide a short overview of your final prototype
- Provide an analysis of the competition – what worked well, what didn't, what you learned from seeing the performance of others' vehicles
  - Discuss important competition results (relative cost, round standings, etc.)*
  - Detail any failures or challenges you encountered.
  - Discuss elements of vehicles that performed better than yours, if it is relevant to what you will recommend

*You do not need to report every metric, but include general standing and those that will support your recommendations.

Recommendations

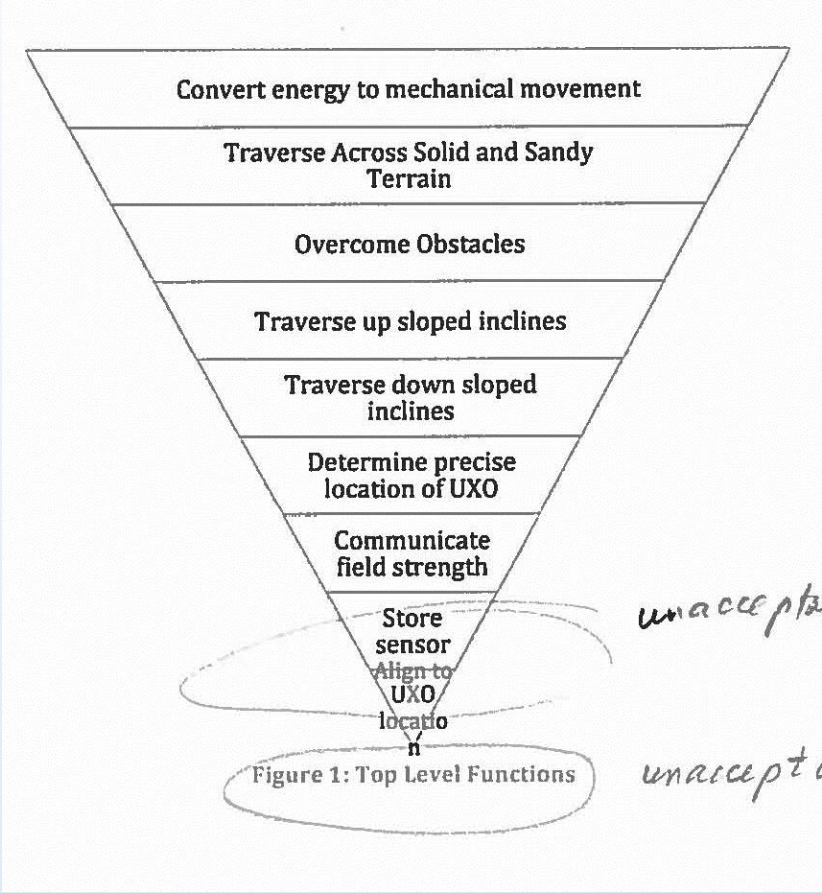
- Include a list of specific recommendations for the client to pursue to achieve the overall project goal
  - Be clear and confident in your recommendations
  - Don’t recommend a slightly altered version of your device if an entirely different design would be better.
- Provide support and justification for your recommendation
  - Recommendations should be clearly and objectively justified by the results you have presented in the report. The link between your findings and your recommendations must be clear.

A Note on Report Sections

- The report sections can be assembled in an order of your choosing, but the elements should flow from one section to the next.
  - For example, the ordering of functions in your function decomposition should be consistent with the strategy you describe. Likewise, the concepts presented should directly relate to your most deterministic functions from your function decomposition. Lastly, your evaluation should clearly address the assessment, selection, and refinement of presented concepts.
- Avoid the urge to simply describe things chronologically.
  - You don’t need to write about things in the order you actually did them. And you should not write early sections as if you don’t know what happens in the later sections (i.e. as if you are writing in “real time” as you are completing the steps)

A Note on Figures, Tables, and Graphics

- Include relevant figures and tables as you refer to them
  - Don't put in appendix unless they are not necessary for understanding the text but are still of interest to some readers
- Make sure your graphics are readable!!
  - Don't use "fuzzy" graphics
  - Use 10 pt font for labels



Conclusions

The Conclusion section should:

- Provide a brief summary of the key information in the report
- Highlight the major outcomes of your work and the competition
- Draw from material you have already presented (no new data or analyses)
- End by firmly restating your recommendation

Appendices

- Use the appendices to present detailed information that detracts from the flow of the report body
- For this report, there are several required appendices:
  - Function Structure Diagram
  - Prototyping Analysis
  - Drawings
  - Bill of Materials

Refer to the Project 1 Report Guidelines for detailed information on what is required in these appendices

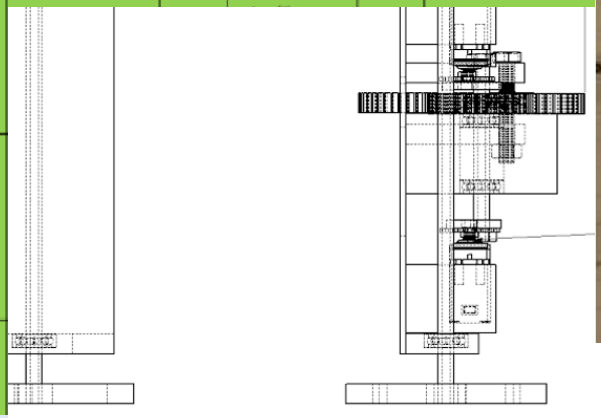
- Include additional appendices if they will support your design decisions and recommendations
- Order appendices in the order you refer to them in the text
  - Note that as you edit, the order of appendices (and therefore their letter) in the text may change. Make sure you **proofread** to ensure appendices are in the right order, and that appendix letters and titles in the text match what is on the appendices at the back.

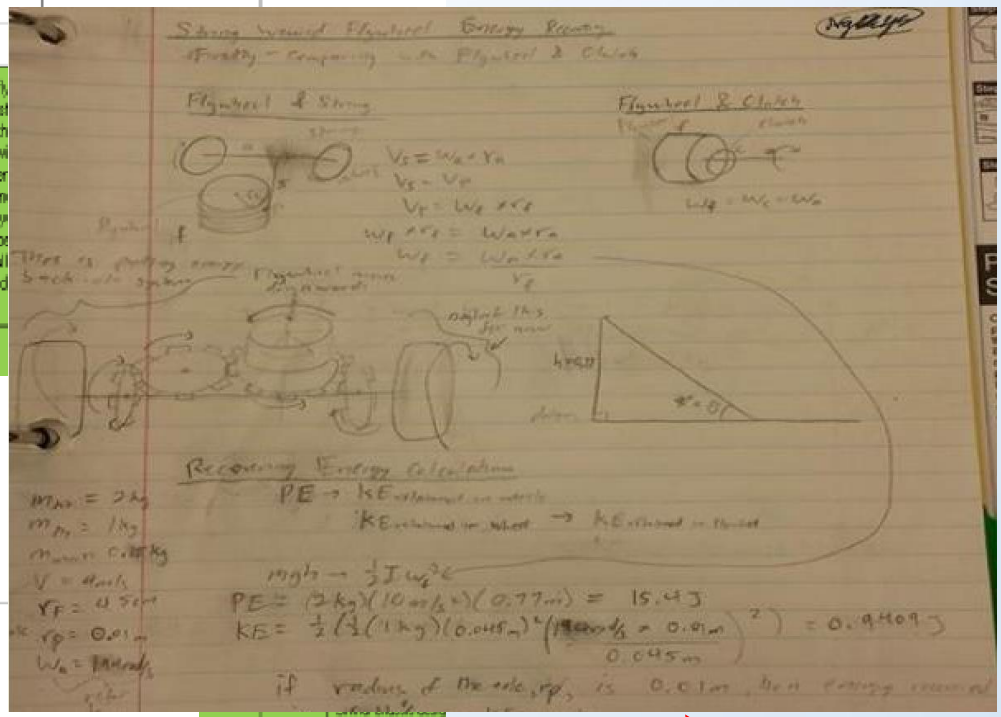
Appendices (continued)

- Give each Appendix a clear title
- Make sure content in appendices is readable
- Don’t “warp” images
- Use professional-looking images
- If something is supposed to be to scale, make sure it prints to scale
- You can print photos landscape and use larger paper and then fold it, if necessary

(Bad) Examples: Appendix Images

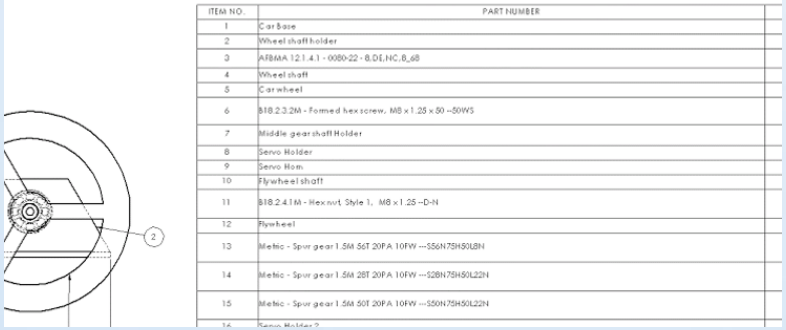
Pugh Chart 2016			Concepts									
Evaluation Criteria	Flywheel with Clutch		Flywheel with Mechanical Timer		Mass Impact		String wound flywheel		Flywheel + Eddy current braking		Torsional Spring + Planetary gea	
		Ranking Justification	+/S/-	Ranking Justification	+/S/-	Ranking Justification	+/S/-	Ranking Justification				
Efficiency in storing energy	S	Datum	S	Flywheel has the same estimated energy storage efficiency of 25%	-	Estimated energy recovery for propulsion is only 4%, which is less than that of a flywheel.	-	For the angular velocity of the fly to be greater, the radius must smaller; but if this is the case, th moment of inertia and mass w less, and it will have less influe the popuision force. Refer to bin calculations "String Wound Fly Calculations". It was found to be efficient when radius of the pul the axle was 1.95cm and the rad the wheel was 2 cm.				
Stopping time	S	Datum	S			The vehicle would stop after the mass hits the						
Weight	S	Datum	S									
Aesthetics	S	Datum	-								S	This design does n improve or hurt the aesthetics of the vehic





Warped image/fuzzy text

Unprofessional!



ITEM NO.	PART NUMBER
1	Car Base
2	Wheel shaft holder
3	ABMA 12.1.4.1 - 0080-22 - 8.DE.NC.B_68
4	Wheel shaft
5	Car wheel
6	B18.2.3.2M - Formed hex screw, M8 x 1.25 x 50 --50WS
7	Middle gear shaft Holder
8	Servo Holder
9	Servo Horn
10	Flywheel shaft
11	B18.2.4.1M - Hex nut, Style 1, M8 x 1.25 --D-N
12	Flywheel
13	Metric - Spur gear 1.5M 56T 20PA 10FW ---S56N75H50LBN
14	Metric - Spur gear 1.5M 28T 20PA 10FW ---S28N75H50L22N
15	Metric - Spur gear 1.5M 50T 20PA 10FW ---S50N75H50L22N

Unreadable text
(too small)

Glossary

- Refer to the notes in your textbook on glossaries and sentence definitions
- The first time you use a term that needs to be defined:
  - Put an asterisk (*) by the word to indicate that there is a footnote. In the footnote, explain that asterisked terms are defined in the glossary at the end of the report. Then, asterisk all future terms that need defining (but don't add any more footnotes).
- Don't use abbreviations and send the reader to the glossary to see what they stand for. The first time you use an abbreviation, write it out in full with the abbreviation in parentheses beside it.
  - E.g. The National Aeronautics and Space Administration (NASA) is an independent agency of the executive branch of the United States federal government…. (from Wikipedia)

Questions?

- We will look at examples of past reports in class/tutorial
- Read through the report rubric and the handout you got from your 223 instructors for additional information. Please note that this is a summary of those two documents, and not meant to replace them.
- Email me (adrianna@mech.ubc.ca) or come see me in my office (CEME 2205A) to discuss anything you feel unsure about.