

Memorandum

Date: January 3, 2018

To: Mech 223 Students

From: Dr. Peter Ostafichuk, Mr. Markus Fengler, Dr. Agnes d'Entremont, Ms. Adrianna Eyking

Re: Written, Oral, and Poster Presentation Guidelines for MECH 223 Project 1

Introductory Summary

For MECH 223 Project 1, you will present your work in a written report, a poster display, and an oral presentation. Your presentation material will be based on the early stages of the design process (including functional decomposition, conceptualization, performance estimation, evaluation, and decision making).

The report for Project 1 (hereafter referred to as simply “the report”) will be a formal document written collaboratively between all members of your design team. Your design team will also collectively prepare and deliver both poster and oral presentations. Detailed instructions for the preparation of the report, poster, and oral presentation are outlined below.

1 Written Report

The purpose of the written report is to recommend a solution for Project 1 to the client for the project. You will present and analyze several of your design alternatives, consider the competition results and provide a recommendation for what you believe is the best solution. You need not recommend your team’s solution if you feel that another team’s entry has the most promise. As part of the analysis, you will outline the strategy that you adopted for the competition, and show how the mechanisms and design features you used in your design support that strategy.

You will write this document for a mixed audience that includes the MECH 226 instructor, the MECH 223 instructors, and the MECH 223 teaching assistants. You may assume that the MECH 226 instructor has a layperson’s understanding of Project 1 and the design process, and that the MECH 223 instructors and teaching assistants are intimately familiar with both.

Further information for preparing the report, including background material and required sections of the report body and appendices, is outlined below.

1.1 Related Readings

Formal reports are discussed in Chapter 21 of your MECH 226 textbook, and an example report is provided on pages 519-530. Be aware that your report will contain extensive appendices while the example report in the textbook has none. An example of an appendix can be found on page 569 of the textbook. You should also review the material in Chapter 12, “Designing Visual Information.”

1.2 General Requirements

Your report will be written in a formal report format with appendices. The text of the report should be doubled-spaced and in 12-point font. The body will be restricted to a maximum of 2500 words (this is approximately 10 pages of double-spaced text, without illustrations).¹ Please include relevant figures and tables in the report body as you refer to them; do not delegate them to the appendix unless they are not necessary for understanding the text but are still of interest to some readers. Appendices are restricted to an additional 2000 words and should make extensive use of tables and figures. The style and format of your report should be consistent throughout.

Two printed copies of your report must be submitted to the Mech Office (CEME 2054) no later than 9:00 am on Monday following the competition. The report should look professional when submitted. For example, an old paper folder with handwriting on the front is not professional looking. If you wish, you may have your report bound by a print shop, but that is not required. Both copies should contain all elements of the report described in this document. One copy must be clearly addressed to MECH 223 instructors and one must be clearly addressed to the MECH 226 instructor.

1.3 Elements of the Report Body

Your report should contain an executive summary, an introduction, the body sections described below, recommendations, a conclusion, and appendices. (Use the appendices to present detailed information that detracts from the flow of the report body; appendices are discussed separately in Section 1.4.) The report sections can be assembled in a format and order of your choosing, in accordance with the MECH 226 guidelines. The required sections for the report are:

- **Strategy.** Describe the strategy that you adopted to address the competition requirements. The term “strategy” refers to the choices you make about how to approach the project, with special attention paid to how these choices are linked to your assessment of the scoring system. You should explicitly identify where you believed, early in the design process, that design effort would pay off, even after accounting for any likely trade-offs that would be required to achieve these anticipated gains. Since there is a common project for the whole class, do not spend time summarizing the detailed goals of the competition (although a brief orientation to the main purpose of the competition is a useful part of the introduction for a non-involved reader). Instead, focus on the aspects that make your approach to the design problem unique. You may also present aspects of how you organized your team if you believed those organizational decisions would likely pay off with a higher score; explain why you expected this to be so.
- **Functional Decomposition.** Present your top-level 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. You will include a function structure

¹ For a project with the scope of your work this term, 2000 words may seem like a very limited space. You will have done much more work than can be fully described within these limits, but this report is the kind of technical summary upon which your superiors will base a decision about your project’s future. Your admittedly difficult task is to be complete, yet succinct.

diagram in the Appendix – you are not required to include one in this section of the report, but you should reference the complete diagram that is in the Appendix.

- **Conceptual Solutions.** Present a brief technical description of each of the key conceptual solutions that you considered. Include the final concept you used along with a variety of your most creative or promising alternatives. You are strongly encouraged to use figures to illustrate each concept and how they work.
- **Evaluation:** Briefly outline your evaluation, screening, and scoring approaches and justify the concept that you chose to develop. Do not simply list a sequence of generic processes. Instead, highlight the specific tools and outcomes you used to objectively support your design decisions. Place detailed analysis, calculations, Pugh Charts, Weighted Decision Matrices, prototyping analysis, and so on in the Appendices (and refer the reader to that work).

The elements above should link and 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.

- **Final prototype and competition results:** Provide a short overview of your final prototype, referring back to decisions made in the stages described previously. You do not need to repeat information already presented, but indicate where readers may find that information. Include important competition results (relative cost, round standings, etc.) and detail any failures or challenges you encountered. 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, i.e. the recommendations should tell the client what steps to take to win the competition if it were to be held a second time. In a professional context, recommendations inform a client what they should spend their money on, based on your expert opinion.

The recommendations you give must be clearly justified by the information you have presented in the report body, including the failures/challenges from the competition. As in the conclusions, ensure recommendations are objectively supported and not based on newly introduced information or assertion.

- **Conclusions:** Following the report body, there should be a conclusions section that connects the key information in your report and highlights the major outcomes of your work. In forming your conclusions, draw from material you have already presented – do not introduce new data or analyses.

1.4 Sections of the Report Appendices

The appendices contain information that is important to the understanding of your report but would not be of interest for all readers. For this report, there are several required appendices

noted below; you should include additional appendices that you feel will support your design decisions and strengthen your recommendations. Include appendices in the order you refer to them in the body of your report – this may be different from the order shown below.

- **Function Structure Diagram.** Provide a top-level function structure diagram for your device. Your diagram should include the top-level functions, arranged as discussed in class, as well as the top-level concepts for each function. Second-level functions and concepts are not expected, but you may include them if you feel it adds to the understanding of your device. Include a sketch or separate description of any concept fragments for which the detailed implementation would not be immediately clear to most engineers. For example, if you have a function “reduce friction of device relative to ground,” a concept fragment of “wheels” is clear and easily understood but “glide system” could mean many things and needs to be sketched or described.
- **Prototyping Analysis.** Provide a brief summary of the key prototyping analyses used in justifying the selection of your final concept. You do not need to include prototyping analyses for concepts other than the final one you selected unless you feel it supports your recommendations. The analyses may include virtual prototypes (calculations or simulation) and experiments with physical prototypes. The prototypes may be focused or comprehensive. In each case, ensure your prototyping analysis clearly addresses these elements:
 - why the prototyping was needed
 - how the prototyping was conducted
 - what results or outcomes came from the prototyping
 - how the findings affected your design or project decisions

Your results should include charts or tables of the data you collected. Ensure that you present clear, objective data and conclusions from your prototyping work. For example, if you are comparing performance of two or more prototypes, give the performance metric you are using (e.g. maximum speed, in m/s) and the measured values for each concept in order to show which is better. Likewise, if you are accepting or rejecting a concept based on a project requirement, give the requirement with the threshold value you are using (e.g. minimum speed = 1 m/s) and the measured value for the concept in order to objectively show whether or not it meets the requirement.

For simulations or programs, a flowchart-style algorithm of your program is preferable, but you may also include the raw code (with comments) if you feel it aids in the understanding of your work. Include examples of typical output given by your simulation/program, as well as an explanation of how that output was used in your project.

- **Drawings.** Include engineering drawings of your final device. All drawings must be professional quality and done to CSA/CAN3 B78.1 standards used in MECH 220. Ensure the scale is properly noted on your drawings and tolerances are appropriately used. The drawings must be suitable for submission to a machine shop for production – do not use screen captures or low resolution images for your drawings, and ensure your drawings are printed to scale. This typically means you cannot include the drawings in your document as an image; you need to print them separately and insert them. You must include at least

- a list of drawings;
- one overall assembly drawing (orthographic or isometric) that points out each subassembly or component in the assembly and includes overall dimensions;
- one top-level exploded view showing how these subassemblies and components are put together; and
- a drawing of the single most complex component you designed and manufactured. If you are unsure about which component to use, speak to one of the course organizers.

If there are any special features or unique components of your design that you would like to highlight, you are free to include additional drawings. You are not required to provide a full set of engineering construction drawings.

- **Bill of Materials.** Include the detailed Bill of Materials and total cost for your project using the format outlined in the Project 1 specifications document. See the project document and additional notes on Connect for further information on preparing your budget.

2 Poster Presentation

Prior to the design competition there will be an “open house” type event in which you will have your vehicle on display along with a poster. The expected audience includes everyone from young children to adults, and the technical expertise and knowledge will be highly varied. Your poster should be interesting and understandable to everyone.

Tables will be provided for the displays. Two or three members from your team will remain with your display to answer questions while the other members will be free to circulate and look at other designs. Team members can change roles during the event such that all students get an opportunity to see other teams’ designs. During this time, aesthetics voting will be taking place (both by the student teams as well as the members of the public).

2.1 Poster Display

To showcase the unique engineering design work and interesting elements of each vehicle, teams will prepare a poster display. Each poster display shall be prepared on a 48” wide x 36” high three-panel (two-fold) presentation board. These are available at the UBC Bookstore and Staples for under \$10.

Teams are expected to create their poster from a series of printed sheets attached to the poster board, similar to the example in Figure 1 on the following page. It is expected that sheets will be 8.5”x11”, computer-generated, and printed in colour, but teams are free to use other print sizes and formats if they wish. **The image shown is a sample only** – sheets can be placed in other locations and orientations (i.e. landscape or portrait or a combination thereof). Ideally, each printed sheet should be the basis for a PowerPoint slide that can be easily adapted for the oral presentation.

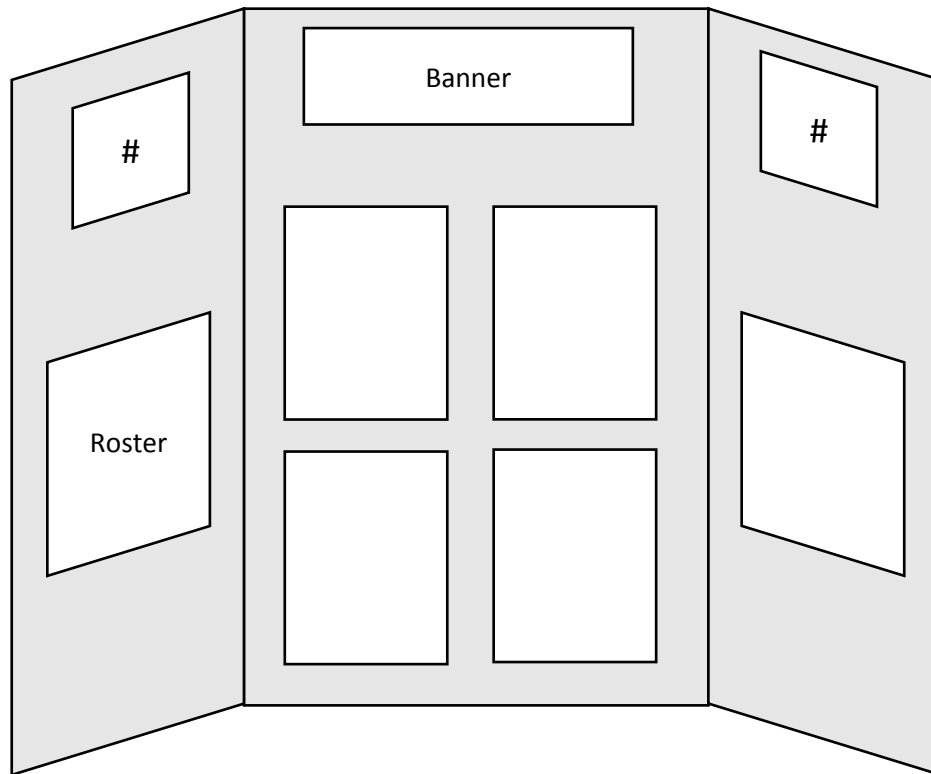


Figure 1 - Sample Poster Layout

2.2 Required Elements

The required elements on each poster are, at minimum:

- A title banner, centred at the top of the middle panel
- Two team numbers (minimum 6"×6", placed on the top of each side panel)
- A team roster showing the members of your team (placed on the left panel)
- A slide outlining your team's overall strategy for the project
- At least two slides highlighting key design or manufacturing tools utilized (e.g. simulation, prototyping, rapid prototyping, etc.) and results from those tools
- A slide summarizing key performance specifications for your vehicle (e.g. top speed, weight, maximum slope that can be climbed, etc.)
- An image (computer rendering or high quality photograph) of your vehicle with key features labelled

It will be up to each team to decide how to present the above material, keeping in mind it should be visually appealing and readily understandable to all.

2.3 Guidelines for an Effective Poster

Your poster display should be eye-catching, professional, and informative. Images, graphs, and tables are often the elements people notice first – be sure to include a brief but descriptive caption with these items. Limit the amount of text you use, particularly text in large blocks. Include headings for the different sections using a large font, and maintain a minimum body font size that can be read at a distance. Recommended font sizes are 75-100 points for the title, 45-60 for main section headings, 28-36 for body text, and 20-28 for captions, figure annotations, and tables. As a general rule, 32 point font is legible from up to about 2 metres away; 60 point font from 4 metres away; and 100 point from about 6 metres away.

2.4 Evaluation

Your poster will be evaluated by a minimum of two people (instructors or teaching assistants) from MECH 223 and MECH 226. They will consider the following five criteria when grading your poster:

- **Design and organization:** the poster layout integrates all elements into a unified, purpose-apparent design
- **Visuals:** drawings, diagrams, and sketches aid in understanding complex content and facilitate persuasion
- **Text blocks and lists:** text is nearly error-free and is effective in supporting visual information
- **Information and audience:** the poster is informative and accessible for both technical and non-technical audiences
- **Professionalism:** the poster positively represents Mech 2, UBC, and the engineering profession

3 Oral Presentation

The purpose of the oral presentation is the same as that of the report: to recommend a solution for Project 1 to the client. Furthermore, the organization of the oral presentation mirrors that of the reports in that you begin with an introduction, then explain your strategy, functional decomposition, alternatives, and evaluation, and finally conclude with a recommendation for your selected design.

As with the report, you will present to a mixed audience that includes your classmates, MECH 226 instructors, MECH 223 instructors, MECH 223 teaching assistants, and other invited guests from the Department. There will be people in the audience who will not have had previous exposure to Project 1.

Background information and details on the format for the oral presentations are outlined below.

3.1 Related Readings

Information on oral communication can be found in Chapter 23 of your MECH 226 textbook, pages 572-597. You should review this material *before* you begin preparing your presentation.

3.2 Presentation Format

The style of the oral presentations is formal. This is in contrast to the casual style that you will be familiar with from class. You are expected to dress appropriately – as you would for a job interview – as appearance will factor into your presentation grade. You should also use language and gestures that are appropriate for a formal presentation.

Presentations should be prepared in PowerPoint or as a .pdf file. Presentation rooms may or may not be outfitted with a document projector. Further information regarding the procedures for uploading your presentation to the computer will be provided on Connect.

Each presentation should last 12 minutes, and will be followed by questions from the audience. After 12 minutes have elapsed you will be allowed a maximum of two additional minutes to finish your presentation. After 14 minutes, your presentation will be stopped by the chairperson of the session. There will be a grade penalty that increases with time in excess of 12 minutes.

All members of the design team must deliver some portion of the presentation (regardless of registration in MECH 226). Decide in advance how you are going to divide the presentation in order to give it smooth flow.

3.3 Presentation Schedules

Oral presentations will be given on the Friday following the competition. Teams will be randomly assigned to one of four sessions. The presentation schedule will be announced on Connect.