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# Design Project

This explains the semester-long team design project.

Here's a [really good design project](#) by a MEC723 team from 2016. If you can match their quality, you'll do fine.

## Establishing Design Teams

Teams will be determined in the Week 1 lab.

Once the teams have been assigned, you should:

- read the design notes on [project initialization](#).
- meet as a team and hold a [kickoff meeting](#) for your project.

You will be [tracking your responsibility](#) as part of the major project. This information will be used when assigning grades to the group project.

You must have and use a [design journal](#) for this project.

## Project Description

In 2021, all students worked together on a single project - an *Organic Home* - which was defined [here](#).

In 2020, all students worked on the project [Addressing Food Deserts in Northern Canada](#).

In 2019, all students worked together on a single project - [Redesigning the Ryerson PTECH Station](#).

## Project Deliverables

The deliverables of a project are those “concrete” things that must be presented to a client (in this case, the instructors) to constitute a completed project. The deliverables for this project include:

1. two design reviews, each with its own [project workload distribution form](#);
2. a final written report (with [design journals](#)); and
3. a final oral presentation by your team to the rest of the class.

The final written report will use [this template](#). Deviations in formatting, font selection, etc. without the express written permission of the instructor will result in a grade penalty.

You can read about [Salustri's grading policy](#).

## Milestone reports

Two milestone reports will be expected from each team. See the [weekly schedule](#) for their due dates.

Each milestone report will cover specific topics and is intended to demonstrate progress made toward finishing your design.

The milestones will be written reports, but there is no particular format. Use point form extensively. **No full paragraphs are required.** You may write prose if you believe it is necessary, but there is no obligation to do so. Be clear, concise, complete, and accurate.

**All members of a given team will get the same mark for the milestone.**

The details of what is expected in each progress report is listed below.

### Milestone #1

The first milestone will be graded according to the [Milestone 1 Rubric](#). It must include:

1. the current version of your team's [PRS](#); and
2. a list of annotated references that were studied during the team's initial [research](#), of where your team found useful information.

### Milestone #2

The second milestone will be graded according to the [Milestone 2 Rubric](#). It must include:

1. a [PAS](#);
2. a [PCS](#); and
3. a list of annotated references that were studied during the team's initial [research](#), of where your team found useful information.

## Final written report

Refer to the [weekly schedule](#) for the deadline of the final report.

Refer to the [reporting guide](#) for general guidelines on writing reports.

The report should be written as a technical report targeted at upper management and technical staff, not a sales or marketing tool to convince prospective customers to “buy” your product.

See the page on [grading team reports](#) for details on the rubric used.

The format (including fonts, colours, pagination, headers & footers, etc.) is very important. **The report format must not be changed.** I will apply [deductions and penalties](#) for changes to the report format.

The following notes explain what goes into each part of the report.

You *may* remove optional section headings if you have nothing to report. Optional sections are indicated below.

### PDF naming convention

When you upload your final report as a PDF to the LMS, make very sure the filename is SSTT Report MEC325 YYYY.pdf.

## Report Title Page

- **Replace the image** on the cover page with a *rendering* of your product.
  - A *rendering* is not a technical drawing. It is a pictorial representation of your design shown in its operational setting.
  - Create a Solidworks drawing in which you turn on shading, perspective, and other options to render a “photorealistic” version of your product.
  - Add a background (which can be done in Solidworks) that shows your product in its operating environment, with other objects in frame to give a sense of size and perspective.
- **Replace TITLE OF PRODUCT** with the name of the product you have designed.
- **Replace the SSTT** in “TEAM SSTT” with your team's actual ID number.
- **Replace the SSTT** in the footer of pages with your team's actual ID number.

## Team Declaration

- Add your names and the last five digits of your student number to this page.
  - Using Google Docs for this will leave evidence that each team member “signed” this sheet in the revision history.
  - Be sure to use your Ryerson account when adding this information.
  - This page acts as a contract with Ryerson, indicating that you have not “cheated” and have been truthful to the best of your knowledge, and that you have shared your Workload Distribution Form with your TA and your instructor.
  - Academic Integrity is vital to a university education; Ryerson's Academic Integrity Policy is available [here](#).

## Executive Summary

- A one-page summary of the project.
  - This must summarize the key features of the design [situation](#) you addressed and of your team's design intervention. Describe *what* you designed, not *how* you designed it.
- Do not discuss the *process* you followed in the Executive Summary.
- See an [example executive summary](#).

## Table of Contents, List of Figures, and List of Tables

- Just what you would expect.
- Page numbers for all entries are required.

## Introduction

This includes:

- a *verbatim* copy of the entire design brief, formatted to match the report;
- an optional description (up to 2 pages in the design brief addenda) of how your team has decided to interpret vague terms or conditions as defined in the design brief;
- up to 5 pages of summary of [situation scan](#);
- identification of your [reference design](#) and an explanation of why it was selected;
- a collection of [situated use cases](#), one per team member;
- a [usage scenario](#); and
- a summary of the [human factor demands](#) of your reference design (details and calculations to appear in an Appendix).

## Problem Analysis

Provide an up to date [product requirements specification](#), including:

- descriptions and justifications of the [human factor capabilities](#) and [personas](#);
  - there must be justifications for each noted HF capability that refers back to the corresponding [human factor demands](#) and why the value of that HF was altered.
- a collection of properly documented [interaction errors](#) for the current situation; and
- revisions, if any, to your [usage scenario](#);
- a full description of the [requirements](#) for your project in [requirement list](#) format, justified with respect to the design brief, personas, usage scenarios, and interaction errors as well as your own background research; and
- an (optional) discussion section of **up to** two pages covering any particularly notable features of this stage of your project, and any extra background research you did during this stage.

## Systems Design

Provide an up to date [product architecture specification](#) for the overall product system. Include:

- a [System Identification Matrix](#),
- a complete [system diagram](#) including quantified [system interfaces](#), and
- an optional two-page discussion of key/interesting/surprising features of the architecture that are not evident from the diagram itself.

## Concept Design

Provide an up to date [product concept specification](#) for the product. There is no need to develop a PCS for each system within it. Include:

- a report of your team's **ideation**, including a morphological chart, and **up to** five pages highlighting any [creativity methods](#) that you used to help you come up with embodiments,
  - (make sure proper attribution is given for all embodiments)
- a listing of **inconsistent embodiments** and a brief explanation of how you identified them,
- a description of your team's **initial set of concepts** and a brief explanation of how you identified them,
- the initial **concept evaluation** including a proper decision matrix and appropriate justifications, where
  - individual DMs are to be placed in a report Appendix, and
  - the summary DM is to be placed in the body of the report;
- a description of how you **refined the concepts**,
- the second **concept evaluation** including a proper decision matrix and appropriate justifications, where
  - individual DMs are to be placed in a report Appendix, and
  - the summary DM is to be placed in the body of the report;
- a final **validation** of your winning concept with respect to the design brief, the usage scenarios, the requirements, and the systems design, and
- a discussion of **up to** two pages indicating any special features of the concept design and any revisions to the usage scenarios that arose from concept design.

## Detailed Design

*No more than 5 pages* of text explaining how you did the detailed design of the product.

- We do NOT expect you to account for every bolt and nut.
- You can specify parts as off-the-shelf by simply quoting a model number and manufacturer (if you can find it).
- Remember to cover as much ground as possible without going into too much detail.
  - Don't spend all your time on the electrical system (assuming you have one) and forget all about structural elements.
- Refer to drawings in Appendix 1 (see below) as required.
- Expand on the operation of the product (as described in the Concept Design part of the report) without just repeating previous descriptions.
- **DO NOT:**
  - describe in paragraph form how your product is assembled<sup>1)</sup>;
  - write a dozen paragraphs describing every part of the product<sup>2)</sup>;
  - write lots of plain text explaining how the product is used<sup>3)</sup>; or
  - pad out this section to get to 5 pages on the premise it will get you a better grade<sup>4)</sup>.
- **DO:**
  - explain any detailed design decisions that were of particular importance to your product; and
  - mention any interesting, special, or surprising features of your product.

## Design Discussion

*No more than 2* pages summarizing the benefits of your design intervention itself, it's key features, etc.

## Project Discussion

*No more than 2* pages summarizing and explaining any points about the *project* and how your team did it that you think is noteworthy.

- Were there any procedural problems during the project?
- Did the team make any major mistakes?
- What most satisfied your team about the design you came up with?

## Conclusion

*No more than 1* page summarizing the entire intervention and project.

## References

Properly cited list of references using the [ASME Reference Style](#).

- This is *not* an annotated bibliography.
- There are two sections in the References: (a) one for parts and assemblies you specify as *off the shelf* in your CAD drawings, and (b) another for scientific and practical data.
- You are required to link the citations in your report directly to the corresponding references.
  - That is, when you cite a source (e.g., [12]) in the body of your work, the number (12 in this case) needs to link to the item in your References section that gives the full reference of the source.
  - We do NOT mean that you must link directly to the actual source (journal, book, website) that you are referencing.

## Appendix 1

Solidworks Drawings - a *set of working drawings* of your product, sufficient to allow someone to actually assemble it.

- Insert drawings into your report in landscape mode, ensuring correct aspect ratio.
- The first drawing(s) would be assembly drawing(s) and bill of materials (including off-the-shelf as well as custom parts).
- Subsequent pages include detailed drawings of all custom parts.
- Because you are typically limited to A-size sheets, you may put the bill of materials on a separate page, after the assembly drawings but before the parts drawings.

- NOTE: Your project may be such that it is not possible to draw the whole assembly drawing or all of the detailed parts. In this case, you are expected to do as much as you can. The instructor will assess whether what you have provided is sufficient.
- NOTE: Off the shelf parts that you found online and that are listed in the bill of materials must include a citation to a reference in your References that provides a URL reference.
- Each drawing **must** have the name of the draftsman who created it.
- The CAD Drawings in this appendix are NOT “figures” and so are NOT captioned.

## Appendix 2 etc.

Whatever other ancillary material you need to demonstrate and justify your design, such as data sheets on components you found on the web or in hard-copy catalogues, or for calculations you wish to include about how you designed your product (e.g. calculating forces, loads, velocities, component sizes, etc.)

## Report tips

### Length of the report

Irrelevant. It must be as long as necessary and no longer.

### Writing style

We're engineers. We don't do “style.” We want factual, dry, simple, easy to read reports. Like a [Vulcan](#) would write. The design is hard enough to understand; you mustn't make the reader's job even harder by using difficult language.

Keep is short and simple, and keep it as precise as possible.

You **can** write “we” if it's obvious from the context who “we” are. Otherwise, use “the team.” You can refer to individual team members by their surnames without titles<sup>5)</sup>

### The report must demonstrate that

you followed the Roadmap correctly and justified your decisions.

Example: You spend 2 hours working on an idea that ends up being removed from the final design. You must (a) count those hours, and (b) briefly describe (a couple of sentences is enough) that work in an appropriate discussion section of the report.

### Unnecessary material is BAD

To include any unnecessary material will be considered an error.

Example: If you're designing a stapler, you don't need to include a whole page about the history of stapling unless there's some specific information that directly informs/justifies decisions you made in your project.

Example: do not explain what the Roadmap process is; we already know.

## CAD Files

Along with your final report, each team must submit a full set of Solidworks files of their design.

- In each case, only one person per team needs to upload material.
- The CAD files must be in Solidworks format; PDF versions are unacceptable.
- Solidworks files will be run through [Graderworks](#) to check for unacceptable copying of work.
- Do **not** zip or compress the Solidworks files. Zipped files will NOT be graded.

## Final Oral Presentation

Refer to the [weekly schedule](#) for the timing of oral presentations.

Suits and ties are **not** required, but a clean, well-groomed appearance is an important part of being a professional engineer.

Presentations will start promptly. Each team will be given EXACTLY 10 minutes to make their presentation.

A PC & data projector will be available, with PowerPoint installed. You will expect to have your presentation on a USB key or a CD.

The presentation should summarize your project in a professional and technical manner. You are **not** trying to sell your product.

Refer to the [reporting guide](#) for further information and tips on presentations.

During the presentations, you will be graded on your ability to present and not on the technical content of your presentation or the merit of your design. Among other things, this includes:

- attire (business casual is okay – suits & ties are not required)
- loudness and tone of voice
- eye contact
- clarity of presentation
- pronunciation and diction
- how you act while your teammates are talking
- quality of your slides and other visual materials

1)  
If you have an assembly plan, add it as an appendix and just comment on it briefly in the 5 pages.

2)  
That's what the CAD drawings are for.

3)  
You can do that in a flowchart that you insert as an appendix. Just comment on it in the 5 pages.

4)  
You won't.

5)  
Example: *“Salustri did X and Neumann did Y while the rest of the team developed the CAD drawings.”*

From:

<https://deseng.ryerson.ca/dokuwiki/> - **DesignWIKI**

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