MECH 431 – 2019S
Major Report Instructions

In order to demonstrate your knowledge of the class material in a comprehensive, holistic manner, and to demonstrate your ability to communicate those concepts, you are required to submit a report that evaluates an engineering economic opportunity (see the lists below for some examples).

Typical subjects are fourth year capstone projects or co-op projects. Some examples include

- Developing biomedical devices
- Custom manufacturing of race cars
- Evaluating machinery purchases and process improvements

Other business opportunities have been used as well, such as

- Investing in real estate for development in Northern India
- Evaluation of a chicken factory in Kyrgyzstan
- The economics of selling hand-made hammocks at a local artisans market

If you have a topic that you're interested in but you feel may not be an obvious fit, or you have questions about how you would do an economic analysis on it feel free to contact me so we can discuss how you might be able to approach it.

The report will be developed, submitted and evaluated in three stages.

Stage 1: Thesis or economic question (6 out of 60)

Try to boil down the major economic question you are asking to a single paragraph. Here you should be discussing the question in terms of the fundamental economic principles at stake, such as

- What scarce resources are being competed for
- What are the potential trade-offs to be considered
- What is the question you are trying to answer (for example, is it worth choosing process improvement A, B, or neither? Or, how much should we pay to invest this business opportunity?)

This should be a paragraph or three explaining what you intend to evaluate for your report.

Stage 2: Outline (6 out of 60)

Create an outline for your report. The grading rubric and the course outline will tell you the items you should cover. Not every specific model or tool in the class needs to be covered, but keep in mind you're trying to demonstrate a knowledge of how the different components of the class come together. The outline should be two levels deep, for example

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1.0 Introduction and Problem Statement
2.0 Background
3.0 Economic Analysis
    3.1 Project Revenues
    3.2 Project Costs
    3.3 Taxes
4.0 Etc
5.0 Etc

When evaluating your outline I will be looking primarily to see that the items from the overall report rubric will be addressed, and looking at the general progression or flow of the report.

Stage 3: Final draft and Final Presentation (48 out of 60)

Report Length:

There is no hard word count. Most of the good reports tend to land within 3000-5000 words. It should be concise, but contain the necessary information to support your arguments and conclusions. Calculations and large tables should go in the appendices, summaries and small examples of calculations can go in the report body.

Submission:

All components of the report shall be submitted through the appropriate module on the course's Canvas page. The instructor reserves the right to have reports submitted to TurnItIn.com as well.

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Grading Rubric for the Final Draft (48 out of 60)

Category	Exceeds Expectations (4)	Above Expectations (3)	Meets Expectations (2)	Below Expectations (1)	Did not complete or far below expectations(0)
Executive Summary and Goals (Thesis)	Clearly presented; Very high level of understanding of background.	Clearly presented; Good level of understanding of background.	Information is presented but more understanding of background should have been demonstrated.	Information is presented but little understanding of background is demonstrated.	
Data (comprehensive, representative, reliable sources)	Very comprehensive data set compiled; Extensive use of primary sources; In-text citations used perfectly; Bibliography well-organized. Uses data in innovative ways	Comprehensive data set compiled; Primary sources mainly used; In-text citations used mostly correctly; bibliography or footnotes present	Data set compiled; Mix-sources; In-text citations used mostly correctly; Bibliography present.	Minimal data set compiled; Mix-sources used; Bibliography incomplete or incoherent.	
Net Present Value or Equivalent Analysis)	Data and calculations are correct and logical, and address the major question	Data and calculations are mostly correct and logical	Data and calculations are mostly correct but illogical for that particular project	Data and calculations are incorrect and illogical for that particular project	
Rate of Return or Equivalent Analysis	Data and calculations are correct and logical, and address the major question	Data and calculations are mostly correct and logical	Data and calculations are mostly correct but illogical for that particular project	Data and calculations are incorrect and illogical for that particular project	
General Economic Analysis (discussion of the economic issues,	Contains the appropriate engineering economic analyses (for that specific project) and they are completed entirely correctly. These analyses are used in an insightful and convincing way in the proposal.	Contains most of the appropriate engineering economic analyses (for that specific project) and they are completed mostly correctly. These analyses are used in an	Contains an adequate number of appropriate engineering economic analyses (for that specific project) and/or they are completed with a range of correctness. Analyses used	Minimal engineering economic analyses completed and/or completed incorrectly. Analyses incorporated into the proposal argument minimally and	

		insightful and convincing way in the proposal.	in the proposal adequately.	unconvincingly.	
Taxes (should be specific to the project or opportunity under study).	Data, calculations and/or explanation are correct and logical	Data, calculations and/or explanation are mostly correct and logical	Data, calculations are mostly correct but explanation or use is illogical for that particular project	Data and calculations are incorrect and explanation or use are illogical for that particular project	
Trade-offs , Opportunity Cost and Scarcity	The report considers the question in light of the fundamental economic issues at stake, and addresses them using the analysis methods throughout	The report addresses the potential trade-offs and addresses them through the analysis.	The report identifies the issues of trade-offs, scarcity and opportunity cost.	The report does not consider the scarcity of resources, or any potential trade-offs.	
Uncertainty and Risk (identify and appropriately analyze major risks).	Clearly presented, high level of understanding demonstrated.	Clearly presented, good level of understanding demonstrated.	Information is presented but more understanding should have been demonstrated.	Information is presented but little understanding was demonstrated.	
Safety, environmental, and social issues (specifically, how do these issues impact the economics under examination?)	Clearly presented, high level of understanding demonstrated, strongly related to project economics	Clearly presented, good level of understanding demonstrated. Somewhat related to project economics	Information is presented but more understanding should have been demonstrated. Tentatively tied to project economics	Information is presented but little understanding was demonstrated. Discussion not tied to how they impact project economics	
Conclusion	Draws strongly from the results of the analysis, and makes a well considered recommendation, accounting for the subtleties and assumptions underlying the analysis, as well as the hard	Draws a firm conclusion logically supported from the analysis presented. Discusses or consider the qualitative components.	Draws a conclusion, but only weakly or moderately supported by the analysis. Does not considered the non-calculated components.	Conclusion does not flow from the analysis presented.	

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	numbers.				
Report Organization and Presentation	Careful consideration has been given to present the report in a clear, concise and professional manner. Very well organized	Report is clearly and professionally presented. Thoughtfully organized	Report is presented in a manner that would be considered is only adequate by professional standards. Adequately organized.	Not much effort was made to present the report in a clear and professional manner. Poorly organized, choppy, confusing.	
Overall Thinking and Communication	Includes concepts that are extremely suitable for the topic and that show original or creative thinking. Extremely capable of communicating ideas and makes clear and convincing argument.	Most or all concepts are suitable for the topic. Some ideas, and arguments are thought through and are communicated well.	Most concepts satisfy the basic requirements for the topic, but some do not directly relate to the topics. Ideas and arguments are thought through at an adequate level and/or communicated moderately well.	Many concepts are inappropriate for the topic. Thinking process is not clear. Very difficult to understand the connection between the analysis and argument for proposed idea.	

Hints and suggestions based on previous reports

- Include your units for everything.
- Supplementary material such as drawings and renderings for context are helpful to a point. Include them to ensure the evaluator understands what is being considered, but don't go overboard.
- Printing – while you will be submitting electronically, keep in mind documents such as these are often printed in black and white, including the copies I mark. Ensure your charts and figures are clear when printed this way.
- Taxes. I know many people don't like taxes, but you need to account for them in this report. While most of the examples in class will be from a Canadian tax perspective, your project may based in another country and your taxes should reflect that.
    - If you are evaluating a non-profit or public project, assess the project as if it would pay income taxes, even if it would not in reality
- Risk, uncertainty, and sensitivity. Address this in a substantive manner. Often the real questions around a project are not "is this worth doing," but "how quickly can this go bad," if we do it
- Text size. My eyes aren't that great, please don't shrink your text to make more of it fit in. Also note captions and text in figures and graphics can be vanishingly small.

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- Remember that all of the tools, models, data, and methods that you use should in some way relate to answering the economic question you posed at the start. If it doesn't help answer that question, you should probably leave it out.
- Have a conclusion. You started with an economic question at the beginning – at the end you should answer it. It's fine if the answer is "this is a poor idea economically speaking, and so from a financial perspective it should not be undertaken."
- Address each item in the rubric. Most poorly graded papers are the result of missing entire sections, as opposed to poorly done work.