

PBL-3. To Retain, Purchase, or Lease new Field Trucks?**Learning Objectives:**

- a. Demonstrate critical analysis skills and capabilities expected of practicing water resources engineers, including to identify, evaluate, and recommend alternatives.*
- b. Apply engineering economic principles and methods to evaluate alternatives.*
- c. Apply multiple criteria in project evaluation*
- d. Gather, analyze, and synthesize data*
- e. Formulate project alternatives*
- f. Coherently and concisely present engineering analysis in written form*
- g. Apply tools to your own financial and investment decisions*

The Situation:

You are a practicing engineer employed at EngineeringEcon Pros, an engineering firm located in Logan, Utah. An environmental engineering company has approached your firm for advice on whether to retain their existing 4x4 field trucks, purchase, or lease new trucks. If you recommend retain, for how long? Use before- and after-tax analysis to recommend whether the company should retain or replace each field vehicle. It is your responsibility to:

- Identify the vehicles your client currently owns and their market prices
- Assume the existing trucks were purchased in 2014 and the company has been depreciating them according to a 10-year schedule.
- Identify a lease option for each vehicle (including initial fees and lease rate)
- Assume the client earns \$15,000 profit for each environmental field job completed. This profit includes everything except vehicle operations and maintenance. On average the vehicle rate is \$0.55/mile, each job requires 5,000 miles, and takes 8 days to complete.
- Identify the number of jobs per year each vehicle will complete and the relevant federal and state (Utah) tax rates.
- Recommend the retain, buy new, or lease new action your client should take for each vehicle.
- Identify the number of jobs per year each vehicle should take to earn a profit (breakeven analysis)

This is a group PBL. Students can work in groups of up to 4 persons. If working in a group:

1. The analysis must include one truck per group member (e.g., a report from a 3-person group must include analysis for 3 different trucks)
2. Choose different trucks (another form of sensitivity analysis)
3. One person submits the report + grading rubric on Canvas
4. Each group member individually completes the Group/Self Rating Form (on main page) and submits on Canvas

You are responsible to obtain all data you need!!

CEE 4200, PBL-3 Grading Rubric

Students: _____

Category (Max. Score)	No Evidence	Far Below Standard	Below Standard	Meets Standard	Exceeds Standard	Self-Score	Instructor Score
Title Page (3)	Absent 0	Evidence of two or fewer title page elements 0	Unclear title, or only 3 of 5 title page elements present. 1	Separate title page. Title, Name, Instructor, Course, Date present 2	Separate title page. Can assess main point from title alone. Name, Instructor, Course, Date, Neat 3		
Introduction (7)	Absent, no evidence 0	There is no clear introduction, main topic, or description of the report's contribution. 1 - 2	Introduction states the main topic but either: 1. Does not give a full overview, or 2. Too detailed, leads to repetition later. 3 - 4	The introduction states the main topic and previews the structure of the report. 5 - 6	Introduction states the main problem, describes report contribution, and previews report structure. Overviews solution strategy. Makes reader want to continue reading. 7		
Organization and report structure (10)	No content provided. 0	Paragraphs fail to develop the main idea. No section headers or guide to help the reader understand how material is organized. 1 - 4	Organization of ideas not fully developed. Paragraphs lack supporting detail sentences. No transitions or section headers. Main report exceeds 2 page. Appendices exceed 2 pages. 5 - 6	Paragraph development present but not perfected. Each paragraph has sufficient supporting sentences. Section headers. Few transitions. 2-page main report. 7 - 8	Writer demonstrates logic and sequencing of ideas through well-developed section headers, paragraphs, and transitions. The first sentence of each paragraph is the summary sentence. Main report is 2 page or less. Appendices, if present, do not exceed 2 pages. 9 - 10		
Engineering Economic Analysis (60)	Engineering economic analysis point(s) not addressed. 3 - 42%	The writer has no clue what they are talking about. 45 - 58%	Sketchy: left out required points. Did not work on this as much as you should have, and it shows. Several important answers are incorrect. 61 - 79%	Necessary points are covered. Most answers are correct. Adequate explanation of methods. 82 - 88%	Provides what was explicitly asked for. The function of each piece is demonstrated to the reader in adequate, but not overwhelming, detail. Answers are correct and reasonable. 91 - 100%		
	a) Depreciation on vehicles (10)						
	b) Before tax analysis (15)						
	c) After tax analysis (15)						
	d) Recommendation (10)						
	e) Breakeven analysis (10)						

Category (Max. Score)	No Evidence	Far Below Standard	Below Standard	Meets Standard	Exceeds Standard	Self- Score	Instructor Score
Word Usage and Format (10)	Not applicable	Numerous and distracting errors in punctuation, capitalization, spelling, sentence structure, word usage, significant figures, tables, and figures. Data vomited onto page(s). Unacceptable / unprofessional at the graduate level. 1 - 5	Misspelled words, poor English grammar and word choice. Main body of report is either longer or significantly less than one page. Figures are too small and/or under-labeled, although they are usually of acceptable quality and focus. Tables incoherent or not cohesive. Bad font sizes. Too much or too little data in appendices. Could be improved by being more meticulous. 6 - 7	Almost no errors in punctuation, capitalization, spelling, sentence structure, word usage, significant figures, and presentation of figures, tables, and appendices. 8	Punctuation, capitalization, spelling, sentence structure, word usage, and significant figures all correct. Clear, consistent fonts. Good word processing skills. Figures have adequate contrast. Informative figure and table titles with numbers. Figures have appropriate axis tick spacing, labels, units, and legends. Table columns cohesive, labeled, and specify units. Equations are numbered. Appendices, if provided, are separated by topic, and each have a title, discussion, and proper formatting and display of information. 9 - 10		
Conclusion (7)	Absent 0	Incomplete and/or not focused. 1-2	The conclusion does not adequately restate the main results. 3-4	The conclusion restates the main results. 5	The conclusion restates the main results, and is an effective summary. 7		
References (3)	Absent 0	Many errors, off- the-wall sources used, and/or few sources cited 0	Some prior work, data, and sources cited. A few references formatted correctly. 1	Most prior work, data, and sources cited. Formatting generally correct. 2	All prior work, data, and sources cited and referenced in correct format. References section is at end of report. 3		
Group Participation (10)	Not applicable.	Project appears to be the work of one person. 1 - 3	Project appears to be the work of only a few group members. 4 - 6	All group members contribute. 7 - 8	All group members significantly and equitably contribute. 9 - 10		
TOTAL (100)							

Additional Comments: