Lab 11: Performance Test 4 – Final Testing

Guidelines for AEV Final Test Evaluation

1. There will be two runs allowed per team and the better of the two runs will be the score awarded.

2. The tests can be run at any time during Performance Test 4 (PT4). Both runs don't have to be on the same day.

3. What if a vehicle does not travel far enough to trigger the gate, or does not travel far enough to engage the cargo?

   Students will be allowed to be stationed at the gate and the cargo area and the students may move the vehicle with their hands. If this occurs the loss of points will occur (points will not be awarded for the step but any steps after can be awarded).

4. If the vehicle crashes into the cargo rather than gently engaging a deduction up to 2 points will occur. The vehicle should have adequate speed and distance control for this not to happen.

5. If the R2D2 unit falls off the cargo carrier, 30 points may be deducted.

6. Two scores will be recorded per run. One score is for the vehicle's meeting the requirements of the MCR traversing the track. The other score will be the Energy/Mass ratio.

7. The final test is NOT a graded item in the gradebook but is a graded item in the Critical Design Review (CDR) Report.

AEV Final Testing Scoresheet

Team/Team Name: _____ Instructor: _____Class Time: _____

This sheet must be filled out and signed by a member of the Instructional Staff by the end of Lab. The Instructor/TA must watch the AEV complete the operational objectives and will record the results below.

		Run 1			Run 2		
Procedure		Yes	No	PTS Earned	Yes	No	PTS Earned
Team shows proper testing procedure (up to 10 points)				/10			/10
AEV starts and travels to first gate				/4			/4
Gate Routine	Stops before gate			/4			/4
	Waits 7 seconds			/4			/4
	Travels through gate			/4			/4
AEV starts and travels to loading zone and waits for 5 seconds				/4			/4
AEV connects to cargo & travels to gate (crashes into cargo-deduct <= 2)				/4			/4
Gate Routine	Stops before gate			/4			/4
	Waits 7 seconds			/4			/4
	Travels through gate			/4			/4
AEV starts and travels to starting point				/4			/4
Total Points Earned				/50			/50
Total Score = Total Pts Earned * Δt					Max Total Score		

Track Layout: _____
(Inside or Outside)

Mass of AEV: _____
(in kilograms)

Total Energy: _____
(Joules)

Total Time Run1: _____
(seconds)

Total Time Run2: _____
(seconds)

Delta Time Run 1:

$$\Delta t1 = 1 + \frac{150 - \text{total time}}{150}$$

= _____

Delta Time Run 2:

$$\Delta t2 = 1 + \frac{150 - \text{total time}}{150}$$

= _____

Energy/Mass: _____
(Joules per kilogram)

Your final score will be based on the **Energy/Mass ratio** (how efficient is the team's AEV) and the **Total Score** (time and distance requirements).

Instructor / TA Signature: _____ Date: _____

Critical Design Review (CDR) Report

(Due Lab 12C: Oral Presentations)

Write a Lab Report

For details on content and formatting, see the Technical Communications Guide on Lab Report specifications.

Executive Summary

- Provide the research focus on the need for an Advanced Energy Vehicle. Address the overall goals and objectives.
- Briefly discuss the research methods used to obtain results.
- Discuss major results and findings from the Performance Tests 1-3 to help obtain the final design vehicle.

Results & Discussion

- Provide a brief description of the group's two prototype AEV concepts used in Lab 08: Performance Test 1 – Design (include a figure of each concept in the report). Describe the evolution of the concepts in Lab 01: Creative Design Thinking to the two prototypes in Performance Test 1 to the final product.
- Provide a screening and scoring tables (Lab 03: Concept Screening and Scoring) to help defend the final design to all concepts and prototypes.
- Discuss the cost of the system. What was done to reduce the cost of the overall system?
- How did this Performance Test affect the team's design process? Discuss the results from the design cycle and the energy optimization during the performance tests.
- Incorporate the following figures into the discussion (from both AEV prototype concepts):
    - Figure of supplied power vs time/distance (team can pick either to plot vs. time or vs. distance).
    - *Table that has a breakdown of Supplied Energy* for each line of code of the AEV's operation (each phase of the vehicle's motion that consumes energy)

** Make sure you include a brief discussion of the figures and tables. Verify that the figures and tables are labeled correctly with appropriate units, title, and x- and y-axis labels **

- What observations did the team make during final testing? How did the AEV behave? How efficient was the vehicle? This is where you discuss the scores on the final test score sheet (include the team's scoresheet in the Appendix).
  Note: if the AEV did not finish the final test, discuss why it did not complete the scenario and provide reasons, not excuses, to why.

Conclusion and Recommendations

- Develop a thoughtful yet concise conclusion from the results obtained in the course.
- Summarize important results from the report.

- Defend the final design and discuss why the team's AEV is the best design compared to the rest of the class (what advantages does the team's AEV have?).
- Provide any recommendations for improvements to the AEV project.

Appendix

- Provide the group's project schedule for the entire semester: start and end dates, due dates, the group members percent completed, their roles for tasks that need to be completed, and the percentage completed (See Technical Communications Guide for example).
- Provide the SolidWorks model of the final design and ensure that the figure has the 3 primary orthographic views with overall dimensions, estimated weight, estimated cost,

Grading Rubric – Critical Design Review (CDR)

Instructor:_____ GTA:_____ Group:_____

Content

							Total
Executive Summary	**Background**		**Results**		**Recommendation**		
	3	Purpose Identified	4	Clear & concise	3	Direct & justified	
	2	Purpose not clear	2	Wordy and/or unclear	2	Unclear and/or weak	___
	0	Poor / missing	0	Poor / missing	0	Poor / missing	10

Introduction	**Purpose**		**Background**		
	4	Good / restated	4	Complete	
	2	Poor / copied	2	Incomplete / not specific	__
	0	Missing	0	Missing	8

Experimental Methodology	**Procedure**		**Equipment**		
	3	Could replicate experiment	3	Thorough description w/ pictures or diagram of setup	
	2	Some details missing	2	Setup unclear or equipment left out	
	1	Missing several important steps	1	Missing pictures/diagrams	___
	0	Exceedingly poor	0	Exceedingly poor	6

Results	**Objectivity**		**Observations**		**Data Placement**		
	2	Objective results	2	Objective observations	4	Easy to find	
	1	Some subjectivity	1	Some subjectivity	2	Some difficulty	__
	0	Mostly subjective	0	Missing	0	Mostly hidden	8
	Data Analysis				**Tables & Figures**		
	4	Logical steps / thoroughly explained			16	Good use of tables and figures	
	2	Difficult to follow or missing critical steps (i.e. sample calculations)			8	Needs more/fewer tables/figures	__
	0	Exceedingly poor			0	Exceedingly poor	20

Discussion	**Analysis**		**Potential Error**			
	4	Clear trends identified & relate to purpose	3	Reasonable / well justified		
	2	Trends unrelated to purpose / some missing	2	Unreasonable / poorly justified		
	0	Exceedingly poor / missing	0	Exceedingly poor / missing		___ 7
	Comparison to Theory		**Defense of Final AEV Model**			
	4	Quantitative and logical	5	Justified w/ data & theory of matrices		
	3	Qualitative or illogical	3	Justified w/o data or theory of matrices		
	2	Poor / Lacking critical details	2	Not fully reasoned / verified		
	0	Exceedingly poor / missing	0	Exceedingly poor / missing		___ 9
	Screen AND Scoring Matrices		**Observations from Final Run**			
	3	Justified w/ data & theory	3	Justified w/ data & theory		
	2	Justified w/o data or theory	2	Justified w/o data or theory		
	1	Not fully reasoned / verified	1	Not fully reasoned / verified		
	0	Exceedingly poor / missing	0	Exceedingly poor / missing		___ 6

Conclusion & Recommendations	**Summary**		**Conclusions**		**Resolving Error**		
	7	Summarized experiment, results, & discussion	7	Supported by data & relevant to purpose	6	Addresses error / reasonable	
	5	Summary lacking in parts or missing critical part	5	No link to results / discussion	4	Unaddressed or unreasonable	
	3	Poor / missing two parts	3	Lacking critical thinking	2	Poor / Lacking thought	
	0	Exceedingly poor / missing	0	Very poor / missing	0	Missing	___ 20
	Recommendations		**Reasons for Incompleteness**		**Format & Language**		
	7	Well thought out / reasoned	7	Justified w/ data, theory, & suitable references	6	< 2 mistakes in format < 2 mistakes in language	
	5	Not fully reasoned	5	Justified w/o data or theory or references	3	4-6 mistakes in total	
	3	Very poor	3	Not reasoned / verified	0	> 6 mistakes	___ 20
	0	Missing	0	Very poor / missing			

	Schedule		SolidWorks Models		
Appendix	18	Has completed/start/end dates, group members, percentage completed, roles, tasks, and estimated hours. Formatted Correctly	18	Has final model with bill of materials, overall dimensions, weight, cost and 3 views	
	12	Lacking a few of components from above	12	Lacking a few of components from above	
	9	Has very basic information, formatting issues	9	Missing prototype / has very basic information	
	5	Lacking or exceedingly poor	5	Exceedingly poor	__
	0	Missing	0	Missing / Hand drawn	36

Format & Language

Total

	Body Content		Appendix Content		
Content Placement	4	All in correct sections	4	Appropriately placed	
	2	Minor misplaced content	2	Minor misplaced content	__
	0	Large sections of misplaced content	0	Too much content in appendix	8

	Labels & Placement		Referencing		
Labels & References	4	All present w/descriptions & placement	4	Well referenced & described in body	
	2	Some missing or poor descriptions	2	Poor descriptions and/or references	__
	0	Missing or no description	0	Missing references	8

	Errors		Citations		
General Format	4	Fewer than 2 mistakes	3	Proper citations	
	2	2-5 mistakes	2	Few citation mistakes	__
	0	More than 5 mistakes	0	Poor / missing citations	7

	Brevity		Clarity		Flow		
Structure1	4	Concise	4	Clear	4	Smooth	
	3	Some wordy areas	3	Few parts confusing	3	Few disjointed parts	
	1	Very wordy	1	Many parts confusing	1	Many disjointed parts	___
	0	Exceedingly Poor	0	Confusing overall	0	Very disjointed	12

	Professionalism		Tense / Person		
Wording	5	No slang, jargon, etc.	5	No slips in tense/person	
	4	Some slips in professionalism	4	1-3 slips in tense/person	
	2	Distracting / poor	2	4-8 slips in tense/person	___
	0	Exceedingly poor	0	More than 8 errors	10

		Spelling / Grammar / Punctuation
General	5	Minor errors
	3	Few errors, but not distracting
	1	Distracts from readability
	0	Complete lack of proofreading

_ 5

Writing Total	/ 50
Content Total	/ 150
Total	/ 200

Instructor / GTA End-of-Lab Signoff

CDR: _____