ENES 100 Introduction to Engineering Design
Hovercraft Development Contract – Spring 2008

OVERVIEW

A major portion of this semester's ENES 100 course will be the design, construction and testing of an autonomous hovercraft capable of performing a timed overland navigation mission. This endeavor will require a semester-long, multidisciplinary team effort in order to be successful. The instructor will create four teams of 9-10 students with diverse backgrounds and skill sets. Each team will subsequently divide into sub-teams consisting of 2-4 students. Possible sub-teams required to complete this project could be: (1) levitation & structure, (2) propulsion & power, and (3) sensors & control.

Each team will use class-time and time outside of the class throughout the semester to design and assemble a hovercraft capable of completing the specified mission. The best designs from each section will then be entered into a competition against the top hovercraft prototypes from the other course sections.

In addition to successfully navigating the specified route, the mission requires that the hovercraft do so in minimal time. Details of the course layout and the design constraints are given in the product specifications. Additional information about scoring and schedule are given below.

DEVELOPMENT CONSTRAINTS

The group must develop, build and test a hovercraft based on the Hovercraft Product Development Specification HC_PS_004 Rev. A, 22 January 2008.

The group must meet the global development schedule provided in Table I.

While electric motors are an obvious possibility for propulsion and levitation, alternative propulsion sources may be acceptable. It will be up to the instructor's discretion if the chosen source meets the low noise/pollution requirements needed to compete indoors in the Kim Building rotunda.

Table I. GLOBAL MILESTONE DATES

Date	Milestone	Milestone Description
2/27-28/08	MS #1	Project Development Plan Presentation
3/12-13/08	MS #2	Preliminary Design Presentation
3/14/08	MS #3	Preliminary Design Reports
3/24-25/08	MS #4	Prototype Fabrication Begins
4/16-17/08	MS #5	Preliminary Testing
5/9/08	MS #7	Final Testing
5/12/08	MS #8	ENES 100 Competition
5/12-13/08	MS #9	Final Project Presentation
5/16/08	MS #10	Final Project Report

SCORING

Scoring for the Hovercraft competition will be based on distance traveled, time and number of faults. The competition winner will travel the course without faults from beginning to end in the least amount of time. Teams may have up to three scoring attempts. The scoring run with the least number of faults, greatest distance and least time will be used for final placement in the overall competition.

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Faults
A "legal fault" occurs when any part of the hovercraft comes in contact with a wall and immediately "bounces-off". A hovercraft cannot use any portion of any wall as a guide; this will be called an "illegal fault". The judge alone will dictate if a hovercraft has used a wall as a guide. Should this happen, the scoring run is ended at that distance marker and time stamp. The illegal fault that resulted in the end of the scoring run is added to any other faults accumulated during the run.

Distance
The feet markers placed on the track itself will note the distance traveled. Distance will be taken in feet only. The distance traveled will always be rounded up to the next foot. The forward most portion of the hovercraft will be used to dictate the distance.

Time
There is a 10-minute time limit per run that a hovercraft may utilize to cover the track. Should a hovercraft exceed 10 minutes, the judge will note the distance and faults while using 10 minutes as the maximum time. Otherwise, during a scoring run, time will be stopped upon completion of the course, illegal fault, low/dead battery and/or team request. The stoppage of time signals the end of the scoring run. The judge will keep time and only the time from the judge's timer will be used for scoring.

Scoring Criteria
To judge the effectiveness of the hovercraft navigation system, the scoring system is tiered based on number of faults. The highest tier is reserved for those hovercrafts that do not fault at all. For example: a hovercraft that travels 16 feet without fault will place higher than a hovercraft that traveled the entire track with 1 or more faults. Distance will be used to sort hovercraft within a tier; lastly, time will be used as a tiebreaker between hovercrafts that have the same traveled distance.

A hovercraft MUST travel at least 15 feet to be considered for placement. Hovercrafts that do not travel 15 feet during a scoring run are not eligible for placement and will lose one of the three allowed scoring attempts.

For example, consider 6 hovercrafts with the following scores:
- No faults - 35 feet, 5mins 35 secs
- Six faults - complete course, 4mins 15 secs
- One fault - 40 feet, 3mins 01 secs
- One fault – 40 feet, 2mins 59secs
- No faults - 33 feet, 2 mins 23 secs
- No faults - 14 feet, 1 mins 05secs

Applying the scoring system above, these contestants would place in the following order:
1. No faults - 35 feet, 5mins 35 secs
2. No faults - 33 feet, 2 mins 23 secs
3. One fault – 40 feet, 2mins 59secs
4. One fault - 40 feet, 3mins 01 secs
5. Six faults - complete course, 4mins 15 secs

∞. No faults - 14 feet, 1 mins 05secs – NOT ELIGIBLE FOR PLACEMENT

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The undersigned students hereby agree to the following rules of conduct for the group work to be completed as a part of the ENES100 project. **We have read and understand this design contract as well as the hovercraft design specifications and we accept the terms of the class project.**

1) When subgroup meetings are created, the remaining members will be informed of the meeting's time, location, and agenda either in person, through e-mail, or by phone. Any members that could not attend the meeting will be informed of the nature of the discussions and the resulting action items that were assigned.
2) All e-mails concerning the meetings and discussions will be checked and acknowledged at least once a day.
3) If a mandatory meeting is missed, it will be the responsibility of the absent member to find out what happened and what his/her assigned tasks were. Non-emergency absences should be notified in advance.
4) Everyone will take ownership for an equal portion of the work to be completed. Each member will provide deliverables to the group completed and on time. The aspect of the work that each member will be responsible for will be decided by consensus.

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Approved: _____