2008 ASEE MODEL DESIGN COMPETITION

Sponsored by the Two Year College Division of ASEE

Date: June 14, 2007
Dear Colleague,

On behalf of the American Society for Engineering Education (ASEE) - Two Year College Division (TYCD), we invite you to encourage the submission of student design projects for the 10th Annual ASEE Lower Division MODEL DESIGN COMPETITION. This event will be held in conjunction with the 2008 ASEE Annual Convention, Pittsburgh, PA, June 22 - June 25, 2008. This competition is open to 2nd and 1st year students at four and two year colleges and universities.

In this year's competition student teams will design and build a robot capable of collecting eight standard ping-pong balls located in specified locations on a 6' x 8' track with barriers and delivering the balls to a pocket on the track as quickly as possible. The robots must adhere to the guidelines of the model design competition (attached). An oral presentation and written report are included as part of the competition.

The main reason for this competition is for students to gain a better understanding of the design process from start to finish. Designing and building something from an idea is probably why they chose engineering in the first place. Use this design competition as a platform to reinforce their ideas and have some *engineering fun!* We hope to see you and your students' entries in Pittsburgh.

Please find enclosed the guidelines and registration forms for this event. The interest and registration forms are on the back of this letter.

Sincerely,

Paul E. Gordy
Phone: 757-822-7175
Fax: 757-427-0327
Email: PGordy@tcc.edu

John Wadach
Phone: 585-292-2488
Email: JWADACH@monroecc.edu

Results from the

9th Annual ASEE Model Design Competition

June 25, 2007 - Honolulu, HI

The ASEE Model Design Competition is a design/build competition for freshmen & sophomore engineering students at 2-year and 4-year colleges. The competition is held each year during the ASEE Annual Convention. The competition typically involves building an autonomous, battery-powered vehicle to navigate some sort of challenging track and/or complete some sort of task. The recent competition in Honolulu required robots ("Basketball Bots") to deposit 6 ping-pong balls into alternating baskets at the ends of a 2' x 12' track. Scoring for the competition was based on the number of balls deposited in the baskets, the time to complete the task, and the points earned in the presentation phase of the competition.

12 teams competed and the results were as follows:

1st Place – Monroe Community College – Team "Inferno", Rochester, NY
2nd Place – Cedarville University – Team "Mario & Luigi", Cedarville, OH
3rd Place – Jefferson Community College – Team "MacGyver", Watertown, NY

For complete results, including scores, pictures, videos, and more, visit the competition website at http://www.tcc.edu/faculty/webpages/pgordy/ASEE/index.html

Consider bringing a team from your college to next year's competition on June 23, 2008 in Pittsburgh, PA. For more information or a copy of next year's rules, please contact Paul Gordy (Pgordy@tcc.edu, 757-822-7175) or John Wadach, Jwadach@monroecc.edu, 585-292-2488).

1st Place Team from Monroe Community College in Rochester, NY

2008 ASEE MODEL DESIGN COMPETITION
Pittsburgh, PA
COMPETITION GUIDELINES

The American Society for Engineering Education (ASEE) Two-Year College Division (TYCD), Model Design Competition will be held Monday, June 23, 2008 in conjunction with the ASEE Annual Convention in Pittsburgh, PA.

Objective*:*
To design and build a zero-emission robot that will collect 8 ping-pong balls located at specified positions on a track and deposit the balls into a pocket on the track as quickly as possible (in less than 180 seconds). An isometric view of the track is shown below.

Track Specifications:

The track is illustrated in Figures 1 and 2 below:

Figure 1: Isometric View of Track

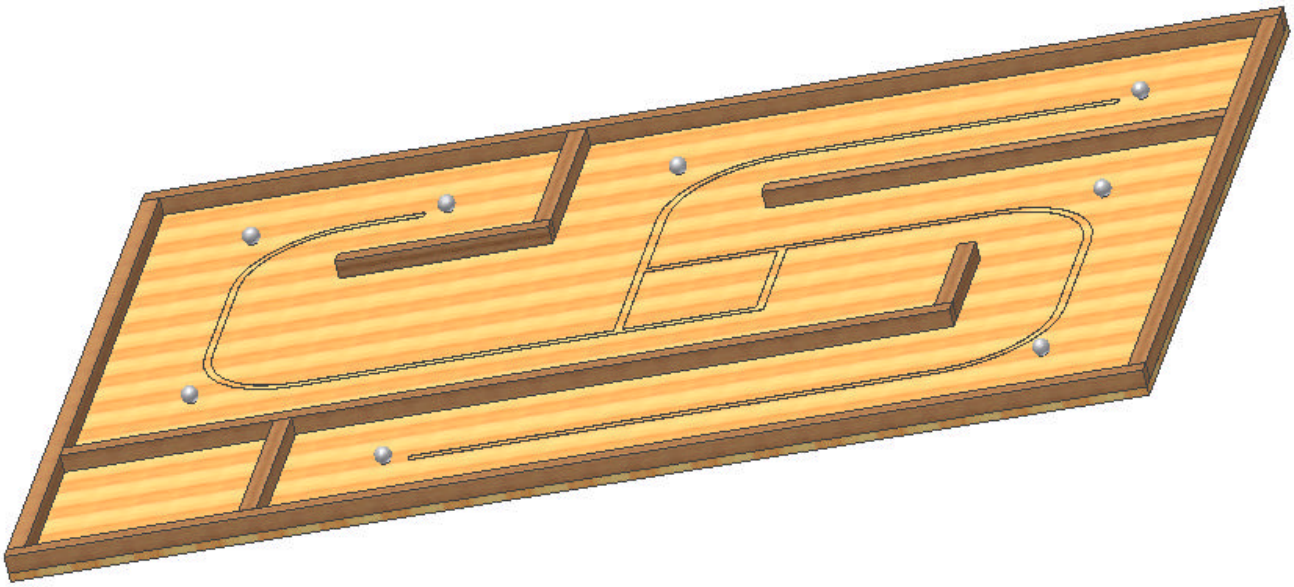
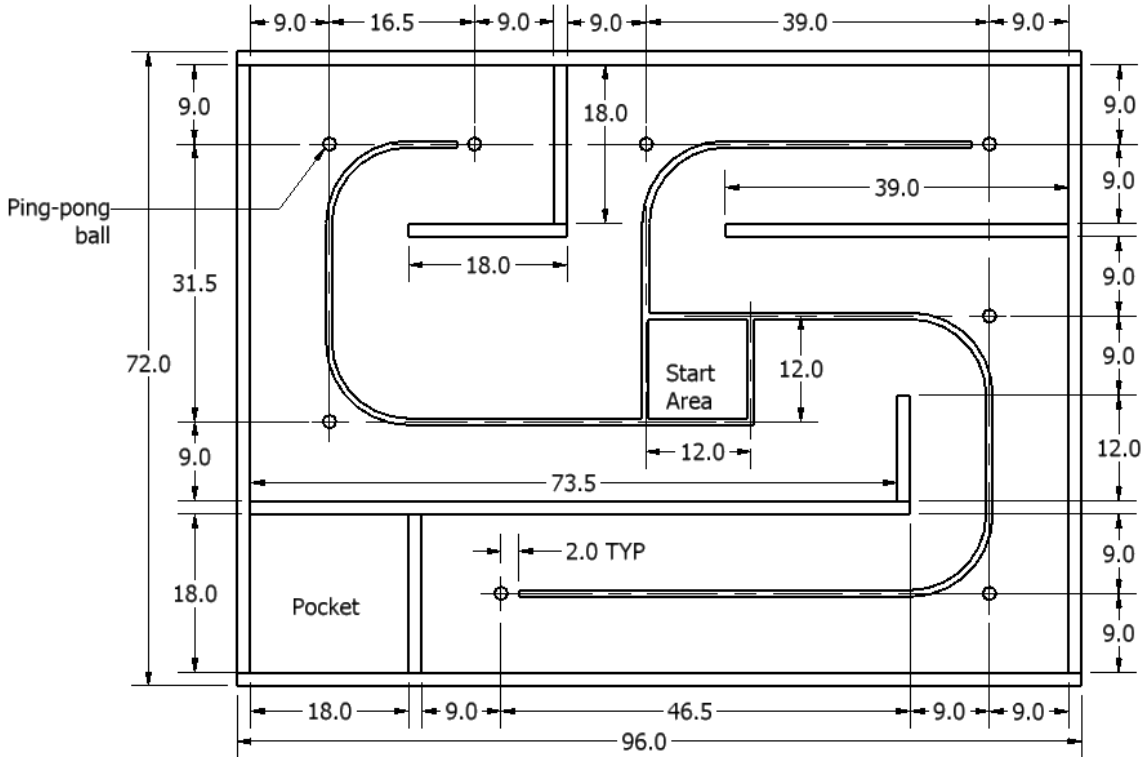


Figure 2: Track Layout (NOT to scale due to copy and paste operations)



Track Materials:

1. One 4’ X 8’ X ¾” sheet BC grade plywood.
2. One 2’ X 8’ X ¾” sheet BC grade plywood.
3. Two 2” X 2” X 69” boards (actual dimensions 1.5” X 1.5” X 69’’).
4. Two 2” X 2” X 96” boards (actual dimensions 1.5” X 1.5” X 96’’).
5. Three 2” X 2” X 18” boards (actual dimensions 1.5” X 1.5” X 18’’).
6. One 2” X 2” X 75” board (actual dimensions 1.5” X 1.5” X 75’’).
7. One 2” X 2” X 39” board (actual dimensions 1.5” X 1.5” X 39’’).
8. One 2” X 2” X 39” board (actual dimensions 1.5” X 1.5” X 39’’).
9. Eight ping-pong balls.
10. One roll of ¾” wide black vinyl electrical tape.
11. Fasteners or adhesive.

Construction Procedures:

1. Place the two sheets of plywood on a flat surface to form the 6' X 8' base for the track.

2. Fasten the nine 2" X 2" boards in the locations indicated in Figure 2.

3. Drill eight ½" diameter holes in the base of the track in the locations specified. The holes should be deep enough such that the ping pong balls will sit on top of the holes and will not touch the bottoms of the holes.

4. Draw lines on the track using the centerlines indicated in Figure 2. Apply the black vinyl electrical tape so that the centerline of the tape is coincident with the centerlines on the track. Do not stretch the tape while applying it or it may not stay affixed to the track. Note that all curved portions of the tape have a radius of 9" to the center of the tape.

5. Place one ping pong ball onto each of the eight holes in the track.

Vehicle Specifications:

Allowable Energy Sources:
Any energy source is allowed as long as it is completely contained within the robot and does not create or emit any gaseous, liquid, or solid materials. Energy sources must not present any safety hazards to participants or spectators.

Maximum Robot Size at Start:
At the start of a trial the robot must fit completely within the Start Area indicated on Figure 2. No part of the robot may initially be over any part of the black tape around the edge of the start area. Note that Figure 2 shows the size of the Start Area as 12" x 12" to the center of the tape, so the area inside the tape is 11.25" x 11.25".

Maximum Height: 12.0 inches
Maximum Width: 11.25 inches
Maximum Length: 11.25 inches

Before each trial the judges may inspect the robot to insure that the size and placement requirements are met. Once a trial has begun the robot may expand into any size.

Components, Fabrication and Cost:
Team members using materials which are commonly available to the general public must perform all fabrication. Use of commercially available vehicles, robots, or entire kits such as RC cars, Legos, K-nex, Fischer-Technics, Parallax or erector sets may not be used. Individual components from these cars, robots or kits may be integrated into a team's robot as long as the majority of the robot's components are not from the same car, robot, or kit source. The cost of purchasing all components must not exceed $350.

Robot Navigation:
A trial will be initiated when a team member presses or pulls a button, lever, string, or other starting mechanism on the robot. Energy from the team member's body may not be used to propel the robot or cause components to move on the robot. Once any portion of the robot begins moving the team members may not touch the robot. The robot must be capable of completing the tasks without any input from the team. Team members may not operate radio, infrared, ultrasonic, electrical, or other remote controls once the robot begins moving.

Static Judging:
During the oral presentation session, each team must have their robot on display for the entire session. The judges will inspect the robots for safety and compliance with the rules. If the judges determine that a robot presents a safety hazard, or has the potential to damage any property or the track, the judges will not allow that robot to run in the testing phase of the competition. If the judges decide that a robot is not in compliance with the intent of the rules they will assess a penalty to the team that is proportional to the severity of the violation.

Robot Testing:

1) Before each trial eight ping-pong balls will be placed on the holes in the track. Each team should bring their own ping-pong balls, although the judges may opt to provide the ping-pong balls. The ping-pong balls may not be modified in any way.

2) The robot must begin with all parts of the robot within the START AREA and no part of the robot over the black tape surrounding the START AREA. A team member should start the robot when a signal is received from one of the judges.

3) The robot may operate for a maximum of 180 seconds after the judge gives the command to start.

4) The robot is permitted to climb over any barriers, but must remain within the 72" x 96" dimensions of the track. If any part of the robot breaks the vertical planes defined by the outer 72" x 96" dimensions of the track, no points will be awarded for the trial.

5) The trial will end when all 8 balls have been deposited by the robot into the POCKET provided on the track or after 180 seconds or when team members decide that they wish to halt their trial. Balls are considered to be in the pocket if they are completely within the 4 (infinite) vertical planes defined by the inside surfaces of the 2 x 2 barriers of the pocket. No part of the robot or any items other than the ping pong balls may be inside the pocket at the end of the trial. If any part of the robot or any other items are inside the pocket at the end of the trial, no points will be awarded for the trial. Balls are considered to be in the pocket if they are completely within the 4 vertical planes defined by the inside surfaces of the 2 x 2 barriers of the pocket and have made an initial contact with the bottom of the pocket. The judges will stop the trial time when the last ball has hit the bottom of the pocket and no part of the robot is inside the vertical planes of the pocket. For example, a robot arm might move over the pocket to dump the balls, but the official time will not stop until all balls have been deposited and the robot arm has moved back out of the pocket.

6) The Time Trial Score is determined by the number of balls deposited into the pocket within the allowed time plus bonus points if all eight balls are deposited in the pocket within the 180 second time limit. In particular,

Time Trial Score = Ball Score + Bonus Points

Ball Score: There is no distinction between the eight balls on the track in terms of scoring. The Ball Score is simply determined based on the number of balls placed in the pocket in the allotted time.

Number of balls in pocket	Ball Score
1	1
2	1+2 = 3
3	1+2+3 = 6
4	1+2+3+4 = 10
5	1+2+3+4+5 = 15
6	1+2+3+4+5+6 = 21
7	1+2+3+4+5+6+7 = 28
8	1+2+3+4+5+6+7+8 = 36

Bonus Points: Bonus Points are only earned by teams with a Ball Score of 36.

Bonus Points = 54 – 0.3 X (Time to complete the course)

Example 1:

Team	# Balls deposited into pocket	Time (seconds)	Ball Score	Bonus Points	Time Trial Score
A	8	130	36	15	51
B	8	140	36	12	48
C	8	170	36	3	39
D	7	180	28	0	28

Example 2:

Team	# Balls deposited into pocket	Time (seconds)	Ball Score	Bonus Points	Time Trial Score
A	7	180	28	0	28
B	7	180	28	0	28
C	6	180	21	0	21
D	5	180	15	0	15

7) Each team will be allowed to make three trials. In order to emphasize reliability, the total score will consist of the sum of the three time trial scores, along with the presentation score and the written report score (to be described in the following pages).

Total Score = Time Trial #1 Score + Time Trial #2 Score + Time Trial #3 Score + Presentation Score + Written Report Score

8) The order of testing will be determined by random draw (same order used for team presentations). Each team will have one minute to begin a trial after being called. All teams will be called for a trial in a current round before any teams begin the next round of testing.

9) Teams may not make practice runs during oral presentations or after the start of the robot testing session.

10) Teams may make changes or repairs to their robots between trials.

Oral Presentation:

Prior to the testing of the vehicles, each team shall make an oral presentation that is 10 minutes in duration. The judges may reduce the length of the presentations if the number of entries does not allow the presentation component of the competition to be completed in the allotted time. The oral presentation will be followed by questions from the judges. If time allows, the judges may allow additional questions from the audience.

All participants must be present for all presentations. In addition, each team's robot must remain on display in the presentation room for the entire duration of the presentations. Team members may neither work on, nor test their robots during the oral presentations. The judges will perform their static judging of the robots during the oral presentations.

The objective of the oral presentation is to describe the engineering design process that a team used to arrive at the final solution. The oral presentations should include the components listed below. Each of the 6 topics is worth 5 points. A perfect score for the oral presentation is 30 points.

1. Problem Identification:
   What tasks must the robot perform?
   What constraints were present that limited the design choices?
   What technical problems had to be solved in order for the robot to perform the required tasks?
2. Preliminary Ideas:
   Describe the ideas that were generated for solving the problem.
   Were these ideas adaptations from existing products?
   What criteria were used to narrow the list of possible solutions?
3. Refinement:
   What physical, CAD, and/or analytical models were built in order to evaluate the design alternatives?
4. Analysis:
   What data and results were obtained from the models?
   How did this information help guide the design process toward a final solution?
5. Final Solution:
   Display images of the robot, wiring schematics, and flow charts of programs to describe how it works and how it was fabricated. An itemized cost analysis should also be shown.
6. Presentation Quality:
   The following items will be evaluated by the judges to determine the quality of each presentation: team appearance, organization, vocal quality, visual aids.

Written Report:

Prior to the oral presentation, each team must present the judges with 5 copies of their written report. The written report should include the components listed below. Each of the 3 topics is worth 5 points. A perfect score for the written report is 15 points.

1. Executive Summary:
   This summary should be no more than one page using a 12-point font and single spaced. The summary should succinctly describe the problem that was solved, why the robot is an optimal solution to the problem, results of pre-competition testing, and a summary of the cost of the robot.

2. CAD Images, Circuit Schematics, and Programming Flowcharts:
   CAD images should adequately describe the form and function of the robot.
   Circuit schematics should convey how the circuitry was constructed and how it works.
   If a micro-controller was used, a descriptive flowchart of the programming code should be displayed.

3. Bill of Materials:
   The bill of materials should include the following information for each component of the robot: part name, size or part number, vendor name, quantity used, unit price, and total price. You should also sum all the total prices to display the overall cost of the components of your robot. This cost must be less than $350. For components that you did not have to purchase you must still list a vendor where the item could be purchased along with the unit and total price. These prices must be included in the overall cost of the robot.

Scoring:

The final score for a team will be equal to the sum of the scores for the oral presentation, written report, and the three time trials. A team will be disqualified from the competition if they fail to make an oral presentation or do not submit a written report.

Total Score = Time Trial #1 Score + Time Trial #2 Score + Time Trial #3 Score + Presentation Score + Written Report Score

Example:

Team	Time Trial #1 Score	Time Trial #2 Score	Time Trial #3 Score	Presentation Score (30 pts max)	Written Report Score (15 pts max)	Total Score	Place
A	51	48	51	28	14	192	1
B	48	45	45	27	15	180	2
C	54	54	28	29	14	179	3
D	28	57	21	25	12	143	4

Rules Interpretations:

Questions regarding rules prior to the date of the competition should be directed to one of the following:

John Wadach Monroe Community College 1000 E. Henrietta Road Rochester, NY 14623 Phone: 585-292-2488 Email: JWADACH@monroecc.edu	Paul Gordy Tidewater Community College 1700 College Crescent Virginia Beach, VA 23453 Phone: 757-822-7175 Email: PGordy@tcc.edu

On the date of the competition:
The judges will interpret the intent of the rules and make all decisions. If the judges determine that a team is in violation of the intent of any rule or specification, they will deduct points in proportion to the severity of the violation. All decisions by the judges are final and may not be appealed.

PROJECT TEAM / ENTRY LIMITATIONS:

Each team must have at least one faculty advisor and at least 2 student members but no more than 10 student members. Each team member must primarily be enrolled in freshmen or sophomore level classes. Each school may have up to three teams entered in the competition unless there is space available for additional teams. If a school has more than one entry then each team must represent a unique solution to the design problem.

PROJECT INTEREST AND REGISTRATION FORMS:

Please find the entry forms on a separate page. The Interest Form must be received no later than March 1, 2008. A Registration Form for each model design team must be received no later than June 1, 2008.

ASEE ANNUAL CONVENTION PASSES:

It is not required that student team members or faculty advisors be registered for the ASEE Annual Convention. Passes will be provided for all team members and advisors so that they can enter the conference area and exhibition area on the day of the competition. Details for obtaining passes will be made available a couple of weeks prior to the competition.

COMPETITION TIMELINE:

The specific time and location of the oral presentations and robot testing will be sent to all teams and published in the ASEE Final Program and Proceedings booklet. The overall format of the competition is given below.

Morning: Oral Presentations and Evaluations of Written Reports

Afternoon: Robot Testing and Awards

PRACTICE SESSION:

The official track will be available in the Exhibition Hall for teams to practice on prior to and following the oral presentations. Teams should be considerate and only use the track for brief periods if other teams are waiting to use the track. No practice runs may be made during the oral presentations, after the robot testing has begun, or during the halftime period.

AWARDS:

First, second, and third-place teams will receive plaques.

SUNY TYESA COMPETITION

The 2008 State University of New York Two Year Engineering Science Association (SUNY TYESA) will host a design-build competition on or about Friday, May 2, 2008 at one of the SUNY community college campuses. SUNY TYESA will use the same rules and project as the 2008 ASEE Design Competition. Teams interested in participating in the SUNY TYESA competition should contact John Wadach or visit the SUNY TYESA website at: tyesa.org

2008 ASEE Model Design Competition Registration Form

Name of college/university: _____

Team Name: _____

Name of faculty advisor(s): _____

Mailing Address: _____

Phone: _____ Fax: _____

Email (print clearly): _____

Student team captain: _____

Other student team members:

1. _____ 2. _____ 3. _____

4. _____ 5. _____ 6. _____

7. _____ 8. _____ 9. _____

Which students/advisors need badges for the convention center? (Badges are needed if you are not registered for the convention).

Circle one: All need badges. None need badges. Only those listed below need badges.

Please submit this form to :

Paul E. Gordy - ASEE TYCD Chair
Tidewater Community College
1700 College Crescent
Virginia Beach, VA 23453
Phone: 757-822-7175
Fax: 757-822-7334
Email: PGordy@tcc.edu

Return one copy of this form for each team entered by June 1, 2008 (by US mail , fax, or email)

2008 ASEE Model Design Competition Interest Form

Name of college/university: _____

Name of faculty advisor(s): _____

Mailing Address: _____

Phone: _____ Fax: _____

Email (print clearly): _____

Number of model entries expected (maximu m of 3): _____

Please submit this form to:

Paul E. Gordy - ASEE TYCD Chair
Tidewater Community College
1700 College Crescent
Virginia Beach, VA 23453
Phone: 757-822-7175
Fax: 757-427-0327
Email: PGordy@tcc.edu

Return this form by March 1, 2008 (by US mail , fax, or email)