2009 ASEE MODEL DESIGN COMPETITION

Sponsored by the Two Year College Division of ASEE

Date: June 18, 2008
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 11th Annual ASEE Lower Division MODEL DESIGN COMPETITION. This event will be held in conjunction with the 2009 ASEE Annual Convention, Austin, Texas, June 14 - June 17, 2009. 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 nine standard golf balls located in specified locations on a 6' x 8' track and delivering the balls into the appropriate goal 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 Austin.

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

10th Annual ASEE Model Design Competition

June 23, 2008 - Pittsburgh, PA

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 Pittsburgh required robots to collect 8 ping-pong balls and deposit them in the corner goal of a 6' x 8' track. Scoring for the competition was based on the number of balls deposited in the goal, the time to complete the task, and the points earned in the presentation phase of the competition.

18 teams competed and the results were as follows:

1st Place – Broome Community College - Binghamton, NY (Team "Awesome-O")
2nd Place – Monroe Community College - Rochester, NY (Team "Bad Hair Day")
3rd Place – Cedarville University - Cedarville, OH (Team "Tornado")

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 15, 2009 in Austin, Texas. 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 Broome Community College in Rochester, NY

2009 ASEE MODEL DESIGN COMPETITION
Austin, TX
COMPETITION GUIDELINES

The American Society for Engineering Education (ASEE) Two-Year College Division (TYCD), Model Design Competition will be held Monday, June 15, 2009 in conjunction with the ASEE Annual Convention in Austin, Texas.

Event Name: Cattle Roundup

Objective:

To design and build an autonomous robot that is capable of rounding up red and blue branded "cattle" (golf balls) and driving them into the appropriate "corrals" (goals) in less than 120 seconds. Points are scored by driving red cattle into the red corral and blue cattle into the blue corral. No points are awarded for driving cattle into the wrong colored goal.

Track Specifications:

Figure 1: Isometric View of Track (If viewing in black and white, the center ball is blue and all adjacent balls have different colors)

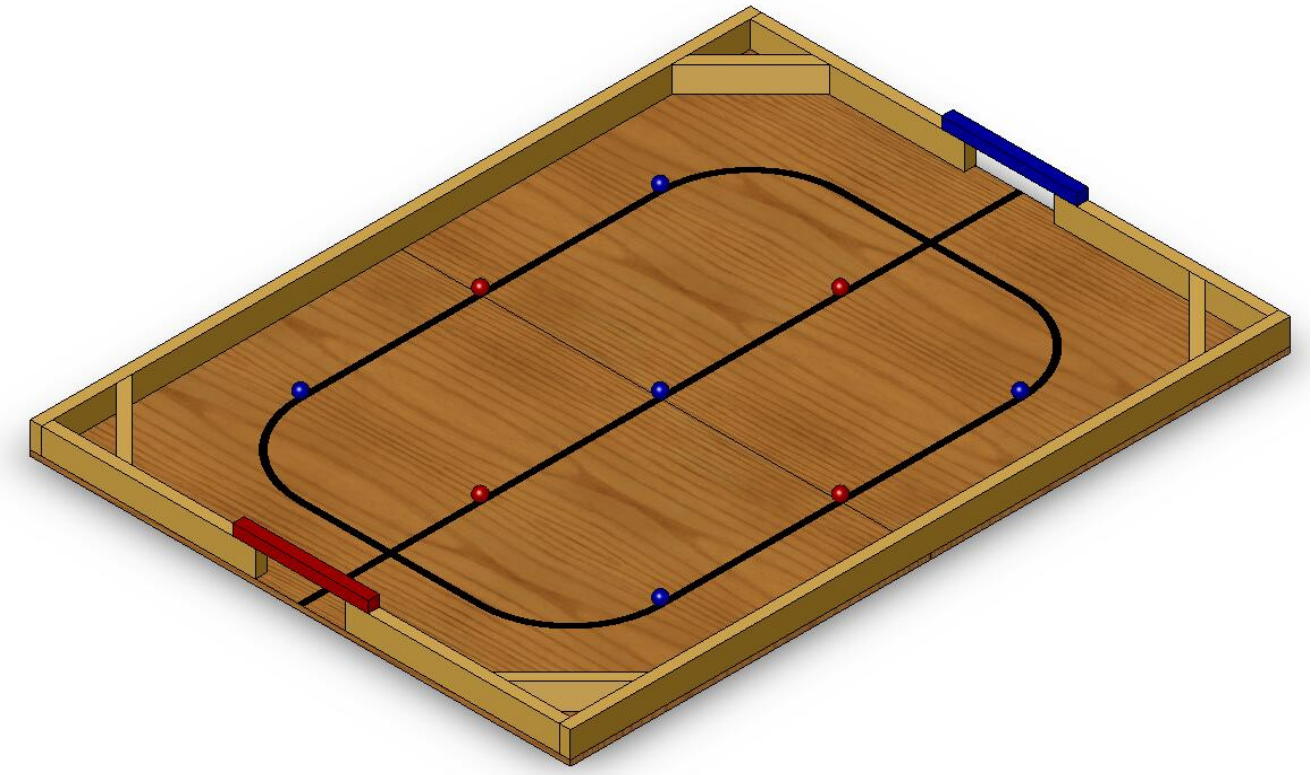


Figure 2: Track Layout (NOT to scale due to copy and paste operations)

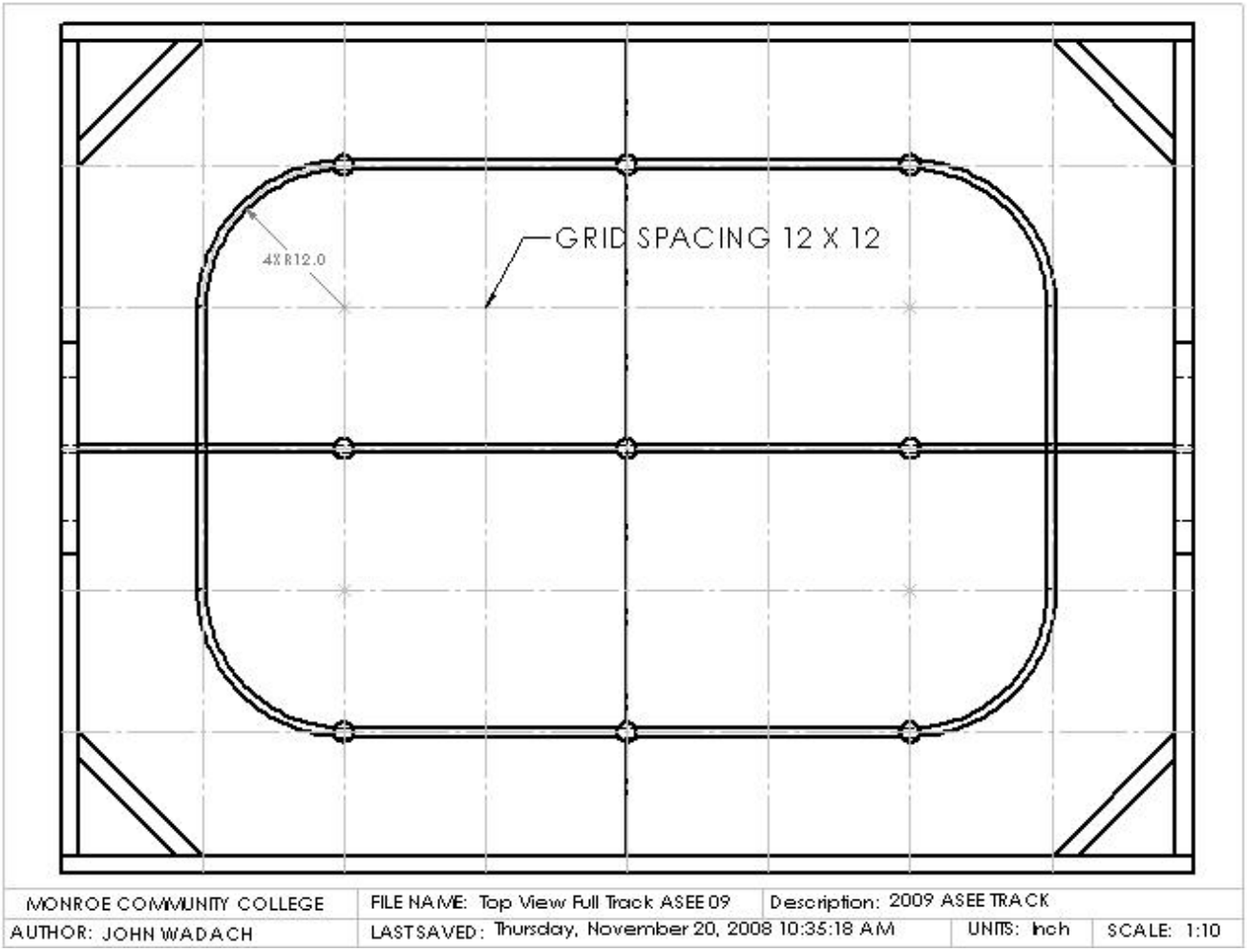
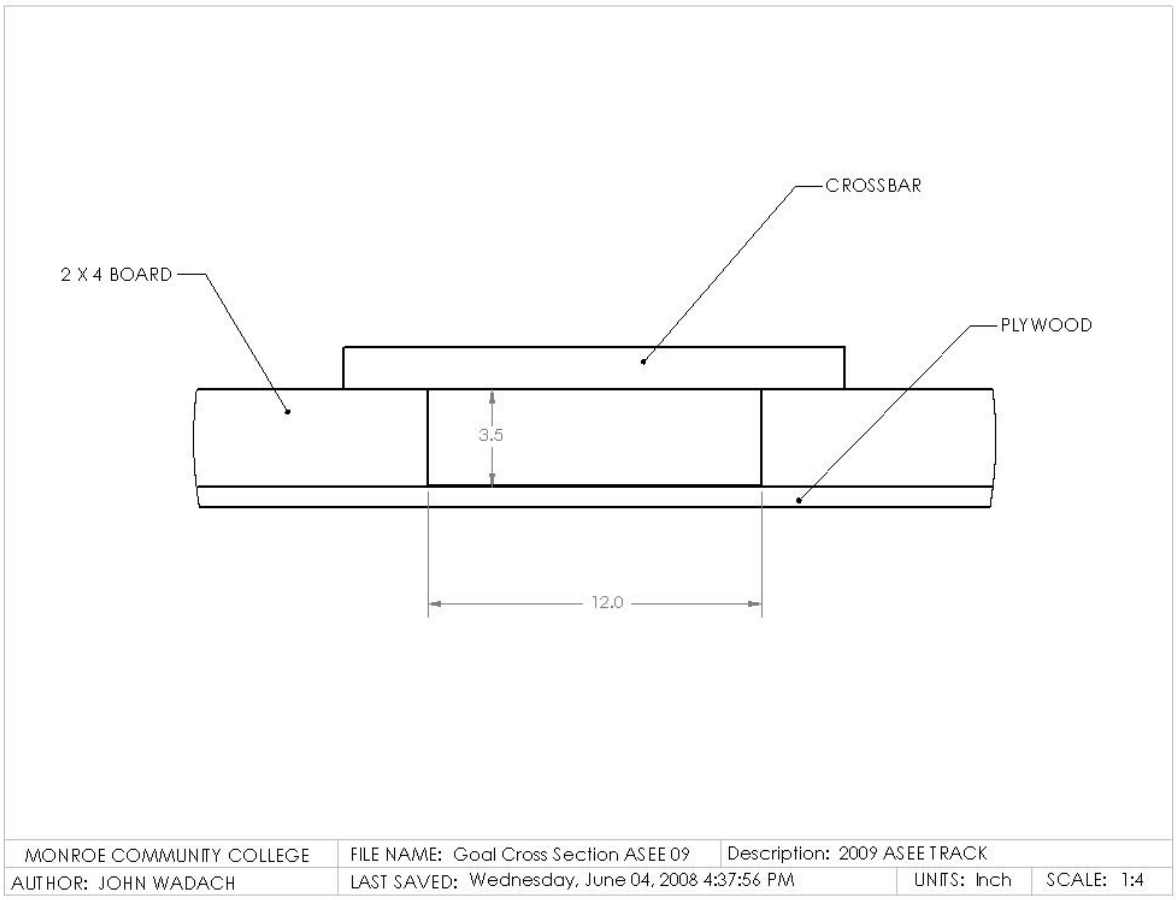


Figure 3: Front View of Goal (NOT to scale due to copy and paste operations)



Track Materials:

1. Two 4’ X 6’ X ¾” sheets BC grade plywood.

2. Two 2” X 2” X 18” boards, one painted red and one painted blue (actual dimensions 1.5” X 1.5” X 18’’).

3. Five 2” X 4” X 96” boards (actual dimensions 1.5” X 1.5” X 96’’).

4. 9 USGA Approved Golf Balls (minimum diameter =1.68”), 5 painted blue and 4 painted red. The golf balls should be purchased from GolfBalls.com at http://www.golfballs.com/PB1731-NBL/Blank-Colored-Golf-Balls-Blue.html (more details are provided under the Robot Testing section).

5. One roll of ¾” wide black vinyl electrical tape.

6. Fasteners or adhesive.

7. 2”x4” boards for constructing a substructure to maintain flatness to the plywood.

Construction Procedures:

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

2. Layout a grid with lines 12" on center along both the width and length of the plywood. Draw 12" arcs where indicated.

3. Cut and Fasten the four 2" X 4" boards in the locations indicated in Figure 2.

4. Paint all sides of one 2"x2" board blue, center it above the goal and fasten it to the 2"x4" boards.

5. Repeat step 3 but paint the 2"x2" board red.

6. 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 12.0" to the center of the tape.

7. Place the colored golf balls in the positions indicated in Figures 1 and 2. Note that the center ball is blue and that all adjacent balls have different colors.

8. To provide for maximum flatness a 2"x4" substructure should be constructed and attached to 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:

Maximum Height: 10.0 inches
Maximum Width: 12.0 inches
Maximum Length: 8.0 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, five blue and four red golf balls will be placed at the specified locations on the track. In order to make sure that all teams are using golf balls of the same size and colors, the golf balls should be purchased from GolfBalls.com at http://www.golfballs.com/PB1731-NBL/Blank-Colored-Golf-Balls-Blue.html It is recommended that you order the following items:
    - Blank Colored Golf Balls - Blue (12 pack) $11.95
    - Blank Colored Golf Balls - Red (12 pack) $11.95
    - The total (with shipping) is around $32.00

   Note that the golf balls cannot be modified in any way. Each team should bring their own golf balls, but the judges will have the option of providing the golf balls to be used during the competition.

2) A robot may start at any position on the track as long as it is neither in contact with, nor directly above any portion of a golf ball. A team member will start the robot when a signal is received from one of the judges.

3) It is the responsibility of the team to inspect the condition of the track and placement of balls before starting their robot to be certain that everything is in order. Once a robot has been started, the run counts as an official trial and may not be done over.

4) The robot may operate for a maximum of 120 seconds after the judge gives the command to start.

5) The robot may extend outside the perimeter of the track but no portion of the robot may touch the floor outside the track.

6) The trial will end when all 9 balls have been deposited by the robot into the goals on the ends of the track, or after 120 seconds, or when team members decide that they wish to halt their trial. Balls are considered to be in the goal if they pass under the colored crossbar and are completely off the plywood surface of the track.

7) If any part of the robot or any other items extend past the outer vertical plane of the crossbar inside the goal at the end of the trial, no points will be awarded for balls deposited in that goal. The judges will stop the trial time when the last ball has hit the floor outside the goal and no part of the robot is inside the goal and past the outer vertical plane of the crossbar. For example, a robot arm might move through the goal to dump the balls, but the official time will not stop until all balls have hit the floor and the robot arm has moved back inside the vertical plane of the crossbar.

8) The Time Trial Score is determined by multiplying the number of balls deposited into the correct goal by 5. Bonus points will be added if all nine balls are deposited in the correct goals within the 120 second time limit. No points are awarded for balls deposited in the wrong goal.

Time Trial Score = (5 X Number of Balls in the Correct Goal) + Bonus Points

Bonus Points = 60 – (0.5 X Time to Deposit All Nine Balls in the Correct Goal)

Scoring Example :

Team	# Balls deposited into correct goal	Time (seconds)	Ball Score	Bonus Points	Time Trial Score
A	8	100	5X8=40	0	40+0=40
B	9	100	5X9=45	60-(.5x100)=10	45+10=55
C	9	120	5X9=45	60-(.5x120)=0	45+0=45

7) Each team will be allowed to make four trials. In order to emphasize reliability, the total score will consist of the sum of the four 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 + Time Trial #4 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 10 points. A perfect score for the oral presentation is 60 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.
   Where did your design ideas originate?
   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 10 points. A perfect score for the written report is 30 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 + Time Trial #4 Score + Presentation Score + Written Report Score

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 2, 2009. A Registration Form for each model design team must be received no later than June 1, 2009.

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.

AWARDS:

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

SUNY TYESA COMPETITION

The 2009 State University of New York Two Year Engineering Science Association (SUNY TYESA) will host a design-build competition on or about Friday, May 1, 2009 at one of the SUNY community college campuses. SUNY TYESA will use the same rules and project as the 2009 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

2009 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, 2009 (by US mail , fax, or email)

2009 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 (maximum 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: 757-822-7334
Email: PGordy@tcc.edu

Return this form by March 2, 2009 (by US mail , fax, or email)