National Society of Black Engineers

Pre-College Initiative presents

2010 Middle School Team Engineering Design Competition

Adapted from Drexel University's Third Annual IEEE Lego Robot Competition

The purpose of the Team Engineering Design Competition is to expose pre-college students to a hands-on, team oriented, collaborative activity that involves mathematics, physics, mechanical engineering, software engineering, computer engineering, electrical engineering, and industrial engineering. Upon completion of the design project, teams will exhibit their designs at the 2010 Fall Regional Conferences held in each of the six NSBE regions.

Region II Fall Regional Conference – November 5-7, 2010 – Pittsburgh, PA (Radisson Green Tree)
Region I Fall Regional Conference – November 12-14, 2010 – Rochester, NY (Hyatt Regency Rochester)
Region III Fall Regional Conference – November 12-14, 2010 – Birmingham, AL (Sheraton Birmingham)
Region VI Fall Regional Conference – November 12-14, 2010 – San Mateo, CA (Marriott San Mateo)
Region IV Fall Regional Conference – November 19-21, 2010 – Indianapolis, IN (Indianapolis Marriott East)
Region V Fall Regional Conference – November 19-21, 2010 – New Orleans, LA (New Orleans Marriott)

NSBE Annual Convention – March 23-27, 2011 – St. Louis, MO – America's Center Convention Complex

Registration for this competition will close at 11:59pm EST on October 31, 2010. **NO EXCEPTIONS CAN BE MADE ONCE REGISTRATION IS CLOSED AND ONSITE REGISTRATION WILL NOT BE PERMITTED!**

Team Engineering Design Team rules

- Each team will consist of only **FOUR NSBE Jr. members** and an **ONE Advisor**
- **The following job titles must be filled by each team members**
    - ○ 1 Industrial Engineer
    - ○ 1 Mechanical Engineers
    - ○ 1 Electrical Engineer
    - ○ 1 Computer Engineer
- Teams are required to meet a minimum of once per week. During this weekly meeting the following is to take place: research, planning, and production of their design.

Prior to registration for this competition, job titles must be determined. Once a team has been formed, the team's advisor must register its members on IMPAK at www.nsbe.org. Teams can purchase their own **LEGO® MINDSTORMS® NXT 2.0** kits for approximately $300.00.

Robotics Kits Requirements:

Teams will only be allowed to use the **LEGO® MINDSTORMS® NXT 2.0.** When creating their robots teams must keep in mind the following regulations:

- Only components from one kit may be used to create a robot.
- No additional parts from other LEGO sets or non-LEGO parts are allowed (Please refer to the List of Approved Parts at the end of this Toolkit).
- No form of remote control can be used in the missions including a LEGO remote control.
- Each robot must be programmed to perform autonomously and can have no human contact or interaction of any kind during the mission.
- Teams must work towards producing a robot according to the specifications listed below.
- All robots will be inspected prior to the actual challenge, any robot found with extra parts from either another LEGO set or non-LEGO set will result in a loss of points prior to the start of the challenge.

EDC Penalties:

Total Points: 150 pts

1st Deduction: 20 pts

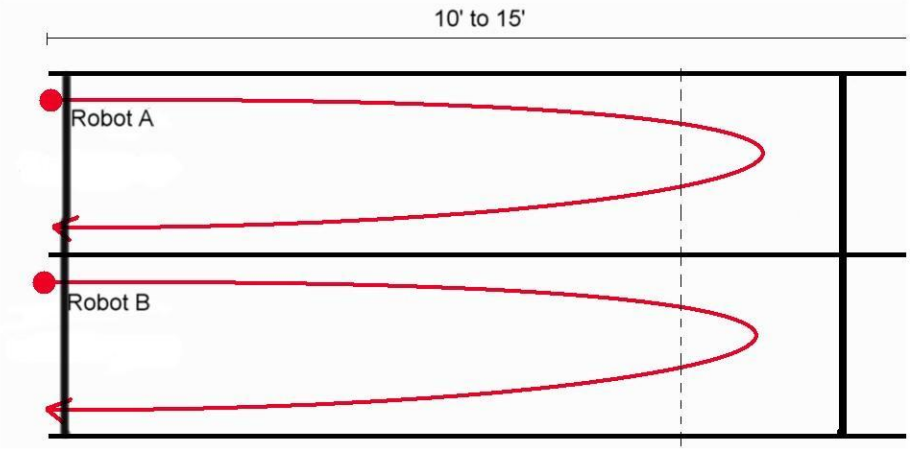
2nd Deduction: 25 pts

3rd Deduction: 30 pts

Penalties Include but are not limited to:
**Tardiness to event*
**Missing components*
**Unapproved components*
**Disorderly Behavior*

The Challenge

Robots will have to travel to one end of a linear track, pick up a ball, travel back to the starting line, and place the ball on the opposite side of the line before the opponent does. Two races will compete head-to-head in a bracket-style competition with the winner of each round advancing to the next round. The track will be between 10’ and 15’ long and between 1’ and 3’ wide for each robot, with the exact length and width of the track to be revealed at the competition. The bottom of the track will be white with black electrical tape around the border and black electrical tape identifying the start and finish lines. The entire robot will be required to pass the “turn around line” denoted by the “turn around marker" before proceeding back to the starting line. Both robots will be released at the same time. The first robot to place their ball on the opposite side of the starting line will be declared the winner. The turn around line will be placed between 10’ and 12’ from the starting line. Please see the figure below for the outline of what the track will look like.



The course consists of a white track with 2 inch wide black edges. Both the start and turn around lines are 1.5 inch black lines. The color and location of the ball will not be announced until the morning of the competition. You may not touch the robot at any point once it begins traveling the course.

SAFETY:
The objective of the competition is to foster engineering creativity and cooperation. The judges are ultimately responsible for ensuring the safety of participants and spectators during the competition. Contestants utilizing any vehicle or feature deemed dangerous by the judges may be asked at any time to suitably modify the vehicle before continuing in the competition. It is the intent of the competition that vehicles not destroy or damage other vehicles. Offending vehicles may be disqualified at the discretion of the judges. Questions may be directed to the EDC Team until competition day at nsbeedc@yahoo.com . Please allow for a 48 hour response time.

Team Engineering Design Competition Rules

Documentation
A successful design process is often dependent upon its repeatability. If the product cannot be created again without the direct input/supervision of the original design team, then, while the project may be a short-term success, it will be deemed a long-term failure. In order to prevent such failure, the steps involved in the product design and development must be carefully documented. In the completion of this design project, all teams must produce detailed documentation as described below.

1. Each team member must produce a detailed report to be submitted at each meeting. This document must contain the members' learning experience throughout the project. These documents must be certified by their advisor's signature. Any missing reports will result in a loss of points.
    a. The report should include a Title Page with team name, chapter, and group members and positions i.e. mechanical engineer – Jane Doe industrial engineer – John Doe
    b. Table of Contents
    c. Abstract
    d. Summary of findings
    e. Student reflections
    f. Diagrams
    g. Conclusion

2. A sequence of operation for the robot must be produced in the form of a flow chart.
3. A diagram of the robot's construction should be produced from start to finish.
4. Programming code should also be submitted with any necessary comments.
5. A list of reference materials used must be included.
6. All documentation must be in electronic format.
7. Documentation must be no more than 25 pages (excluding diagrams and pictures).

Documentation must be submitted in Microsoft Word (.doc) format. No other software will be allowed. File names should be in the following format: *teamname_documentation.*doc. Please use only 12 point, Times New Roman font. All margins should be no larger than 1".
All documentation must be emailed to the EDC Team at nsbeedc@yahoo.com no later than 11:59 p.m. EST on October 31, 2010. All teams will receive an email confirmation of receipt of their documentation within 48 hours of submission.

Oral Presentation

The world of science, engineering, and technology is built around technical presentations. Companies rely on technical presentations from technical experts to provide information to a wide variety of audiences. The topics depend on the project and the stage of production in which one participates, while the audiences range from coworkers in a meeting to thousands of participants at a national or international conference.

The goal of a technical presentation is to provide information in a concise, easily understandable format for your audience. Such presentations are augmented by visuals, but depend prominently upon the oratory skills of the presenters. With your design project, your team must demonstrate the ability to communicate accurately and effectively. The following guidelines must be followed:

1. An oral PowerPoint presentation of 5-7 minutes must be completed, with an additional 5 minutes for questions from the judges.
2. The presentation should be based on the written documentation produced, describing the engineering design and production in a detailed manner.
3. All group members should be active participants in presenting the material.
4. Presentations should at a minimum include:
    a. a. Introduction to the problem
    b. b. Design decisions
    c. c. Robot functionality
    d. d. Learning experience from working with other members of the team

Oral presentations must be submitted in Microsoft PowerPoint (.ppt) only. No other software will be allowed. File names should be in the following format: *teamname_presentation.ppt*.

All oral presentations must be emailed to the EDC Team at nsbeedc@yahoo.com **and your Regional PCI Chair no later than 11:59 p.m. EST on October 31, 2010. All teams will receive an email confirmation of receipt of their presentation within 48 hours of submission.**

Regional PCI Chairs Information:

Region 1 – John Brito (r1pci_chair@yahoo.com)
Region 2 - Elisha Clayton (region2pci@gmail.com)
Region 3 – Chrissi-Lee Williams (region3pcichair@gmail.com)
Region 4 – Luneta Limbrick (r4pcic@gmail.com)
Region 5 – Gerwayne Qualls (region5pcichair@gmail.com)
Region 6 – Selam Hendrix (r6pcichair@yahoo.com)

Robotics Exhibition

1. You will be allowed to use only one robot throughout the entire competition.
2. A maximum of four people will be allowed to compete on any one robot.
3. The length of the robot cannot exceed 8 inches. The width of the robot cannot exceed 3 feet.
4. At the beginning of the competition, each of the robots will be inspected.
5. No modifications may be made to the robot once the competition begins with the exception of programming. Robots may be reprogrammed in between rounds, but may **not** be reprogrammed during a round.
6. You are responsible for providing your own batteries. In the event that your batteries die during the competition, you are responsible for having your own set of backup batteries. NSBE will not provide any batteries.

Notes:

1. Contest rules and specifications subject to change with adequate notice.
2. Field specifications are complete. Construe omission of details as variables in competition.
3. All questions should be directed to nsbeedc@yahoo.com; please allow for 48 hours response time.

Resources

Robotics Links:

http://www.usfirst.org/
http://www.ifirobotics.com/
http://www.vexlabs.com/
http://www.vexrobotics.com/
http://www.chiefdelphi.com/