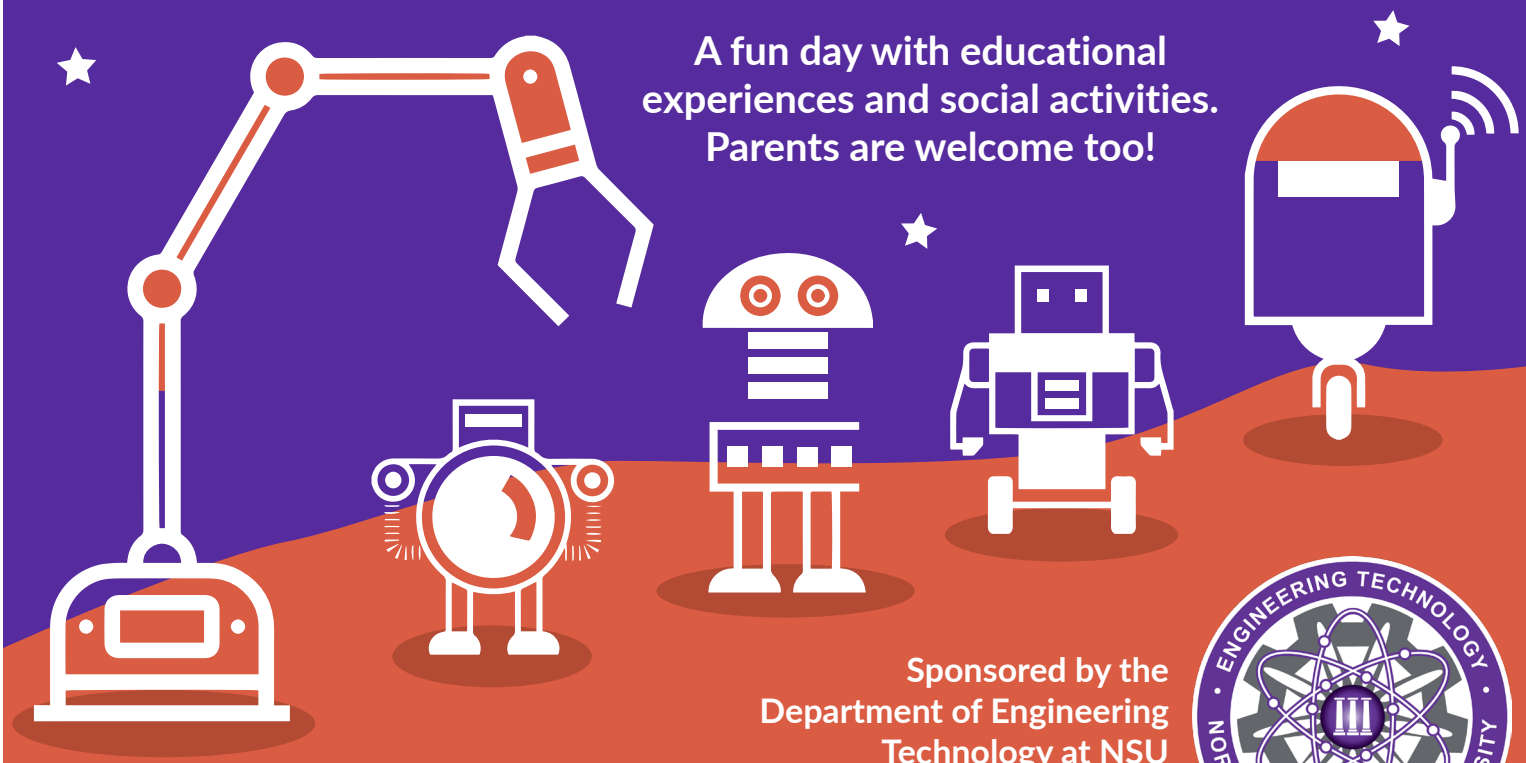
NORTHWESTERN STATE

FALL 2023

ROBOTICS

COMPETITION AND SMART STRUCTURES SHOW (RC&S^3)



A fun day with educational experiences and social activities. Parents are welcome too!

Sponsored by the Department of Engineering Technology at NSU

Wednesday, November 29, 2023
8 AM to 1 PM
Student Union Ballroom

More information can be found by scanning QR code or visit:
nsu.la/ROBOTS2023

CONTACTS: hossains@nsula.edu or jacksonke@nsula.edu

Northwestern State University Robotics Competition and smart structures show

RC&S^3

Fall 2023

What: Northwestern State University Robotics Competition and Smart Structures Show (RC&S^3, Fall 2023)
When: Wednesday, November 29, 2023, 8:00 AM – 1:00 PM
Where: Northwestern State University, Student Ballroom
Contact: Dr. Shahriar Hossain (hossains@nsula.edu) or Ms. Kenyetta Jackson (jacksonke@nsula.edu) - Northwestern State University

The Department of Engineering Technology at Northwestern State University will be hosting its Fall Robotics Competition and Smart Structures Show (RC&S^3) on November 29, 2023. All middle schools within 200 miles radius of Natchitoches City are welcome to participate. This year, we are again organizing a Smart Structures Show to provide opportunities for high schools and other organizations that are involved in robotics-related projects to show their creativity at our event. There is ***no registration fee*** for the competition or show, however, those interested in participating in the competition must respond to the announcement by submitting a ***letter of intent*** and a ***press/photo release form (for each team member)*** no later than November 24th, 2023. All forms are attached. Documents should be sent to Dr. Shahriar Hossain at hossains@nsula.edu

Please note that our theme for our camp this year is Inspired by NASA's Artemis Base Camp on the Moon, which will need light, water, and elevation. We strongly encourage students to participate in all competition challenges to maximize their benefit from the designed STEM activities. We also expect participants to design all their activities around our theme.

Come test your computer programming skills and compete with other Louisiana students for cool prizes! A fun day is planned at Northwestern State University with educational experiences and social activities. The Department of Engineering Technology will provide complimentary refreshments. *Please bring your own lunch*. ***Parents are welcome too!*** Details on the rules of the competition are below.

NSU Fall-2023 Robotics Competition
General Rules and Instructions

Contents:

I. Background

This tournament will test the students' ability to design, engineer, and program a robot that can be used to compete in a robotics competition challenge. The NSU-RC will have 4 events on competition day. The events are as follows: 1. a race/speed challenge, 2. a strength/weight pulling challenge, 3. an accuracy/problem-solving challenge, and 4. a maze challenge.

The main goal of this tournament is to promote STEM-related activities, in hopes of guiding students toward a career in science, technology, engineering, and mathematics. This tournament is designed to be fun while helping them to think above and beyond the limits of their normal robotics studies.

II. General Rules

The following rules will need to be observed to ensure fairness and competitiveness during the competition:

1. There will be a total of 4 events on competition day. Students will have 2 attempts at each event, but only the best score from each event will be used.
2. Teams will be allotted 15 minutes between rounds to make necessary changes and adjustments to their robots as needed.
3. Trophies and prizes will only be awarded to the top three teams that achieve the highest number of points during the competition
4. Only students are allowed to participate in the competition. All work, prior to and on the competition day, must be solely the work of the students' themselves. Teams that receive unauthorized aid will be disqualified from the tournament, and their scores will be forfeited. The role of adults is only to facilitate and supervise team members in the competition area.
5. Only students are allowed in the competition area. While in the competition area, they must not block the judges' view.
6. Teams are not allowed to program another group's robot or maliciously sabotage another group's robot, program, etc. Teams that do so will instantly face disqualification.
7. Students and coaches are responsible for reading over the rules and guidelines of the tournament prior to the date of the competition.

8. NSU will make every effort to ensure fairness and competitiveness amongst team members on competition day. If there is a clarification needed on a rule or aspect of the competition, coaches may submit their query to the appropriate party. (TBA)

9. All judges will be well-versed in the rules and aspects of the competitions and challenges. No photo or video record, made by any individual, will be used for scoring purposes.

10. If the students' robot breaks down during competition, teams will not be allotted time to rebuild or fix their robot.

11. All robots built by students must not exceed the dimensions of 12" x12" x 12". The robot and all of its components (motors, sensors, cables, etc.) must be able to fit inside the starting position of each challenge.

12. All participating robots should consist of only one brick with up to 4 motors attached to it.

13. This is an open robotics tournament. Student groups are allowed to utilize the following robots for this challenge: LEGO Mindstorms NXT or EV3 models, Parallax BoeBots, and VEX IQ, EDR, or PLTW Gateway to Technology (GTT) model robots. The programming platform for robots is up to the discretion of the teams, but Robot-C is highly recommended.

14. All robots must be non-flying, autonomous, and may not be remotely controlled ***except*** for the maze challenge.

15. Teams may only use the materials that come with their respective robotics kits. Teams may not use outside materials such as oil, glue, tape, etc. that may impact the performance of another team.

16. Please bear in mind that the lighting and floor conditions on competition day may be different from that of the classroom, and therefore may impact the performance of a robot.

17. Teams may participate with more than one robot. If a team started a challenge with a certain robot, the same robot would use at the end of the challenge

18. Each school will create and wear name tags that identify the team's school and team number as designated by the RC&S3 tournament. Robots will be marked with the school's name and team number. Robots will only be programmed and used by their assigned team members. Schools should endeavor to maximize their students' ability to code the robot assigned to the team by the school. Students should minimize help provided to another team whether within their school or without. Schools should concentrate on bringing to the tournament an appropriate number of teams and students commiserate with their ability to successfully compete in the tournament. Robots will only be allowed to compete in each event twice and only as a part of the team that programmed and built it. Every effort should be made by each school's leadership to comply with the spirit of competition and tournament integrity.

19. Due to the size of the competition venue, each school is only allowed to bring ***4 teams each, made up of no more than 6 students per team***.

20. Only the first ***25 teams who respond to the announcement by November 24th, 2023,*** will be invited to participate in our robotics competition.

21. Participating Schools may receive only one award.

III. Challenge 1: Speed Challenge Overview

The first part of the robotics competition will be a speed challenge, to test the group's ability to engineer a robot that can race down a straight-line course in the fastest time possible. At the beginning of this challenge, student groups will place their robot behind the start line, and the judges will set a stopwatch to zero. The judge will give a countdown of "3, 2, 1, GO!" Upon the word GO, students will activate their programs. The robot that travels down the 15-foot-long straight-line course in the fastest amount of time possible will win points for this challenge. Only the top 5 teams with the fastest times will receive points for this challenge. Teams that do not travel within the boundaries of the course will face disqualification from this aspect of the challenge. The breakdown of points for this challenge can be seen in section VIII.

Teams that do not place in the top 5 will not receive points. Students will have 2 attempts at this challenge, with only the best score from the two attempts being used for scoring.

IV. Challenge 2: Strength Challenge Overview

The second part of the robotics competition will be a strength challenge, to test the group's ability to engineer a robot that can pull the largest amount (in pounds) of weight, via a tension scale, within a 10-second time limit. Student groups, with the assistance of a judge, will hook their robot up to the tension scale. When the student group is ready, the judge will give a countdown of "3, 2, 1, GO!" Upon the word GO, students will activate their programs. The robot will have 10 seconds to pull as much weight as it can on the tension scale before time is called. All robots must end their programs after 10 seconds, or face disqualification. Students are not allowed to touch or unhook their robots until the judge has recorded the results of this challenge. Students will have 2 attempts at this challenge, with only the best score from the two attempts being used for scoring. Only the scores of the top five teams will be recorded for this challenge.

V. Challenge 3: Accuracy Challenge Overview

The third and final challenge of the competition will be an accuracy challenge, to test the group's ability to engineer a robot that can retrieve a specific item in the fastest time possible. The challenge will take place within an 8'x4' rectangular area, with the robot positioned in the bottom left corner. Students must program their robot to retrieve a red ball from top left corner of the rectangular area, take it to a holder at the middle of the board, and then park their robot at the top right corner of the mat. Once students have positioned their robots in the start position, the judge will give a countdown of "3, 2, 1, GO!" Upon the word GO, students will activate their programs. Once the program is activated, the robot has 1 minute to complete the challenge. The teams that complete this challenge correctly in the fastest amount of time possible will receive points from this challenge. Students will have 2 attempts at this challenge, with only the best score from the two attempts being used for scoring. Only the scores of the top five teams will be recorded for this challenge.

VI. Challenge 4: Maze challenge Overview

In the maze challenge, each team should navigate the robot using remote control from start to end without touching the walls with the minimum time. Dimensions of the maze challenge are explained in the appendix. Both time and accuracy will be observed and recorded. In this challenge, each team member will be given the chance to navigate the robot using the remote control. Robots should stay within the boundaries of the maze without touching walls. If a robot touches the walls, it will disqualify. Students will have 2 attempts at this challenge, with only the best score from the two attempts being used for scoring. Once students have positioned their robots in the start position, the judge will give a countdown of "3, 2, 1, GO!" Upon the word GO, students will activate their robot and start the navigation process through the maze until the end position. The teams that complete this challenge correctly in the fastest amount of time possible will receive points from this challenge. There are segments in the maze. Some partial points will be given for completing each segment before disqualifying. Only the scores of the top five teams will be recorded for this challenge.

VII. Tie-Breaker Overview

In the event that a tie-breaker between two teams is needed, the two teams will engage in a tug-of-war match between their robots. Each team will tie one end of a rope to their robot, each of which will be on opposite sides of a single black line. The judge will give a countdown of "3, 2, 1, GO!" Upon the word GO,

students from both groups will activate their programs. The student group whose robot succeeds in dragging their opponent across the line first will be declared the winner. During play, students are not allowed to touch either robot. If the robots enter a state of equilibrium, the robot that is the furthest from the center line after one minute will be declared the winner.

VIII. Materials Needed for Competition

Challenge 1: Black electrical tape, laid out in a range of 2' x 15' squares for the speed challenge course.
Challenge 2: A tension scale with either a hook or string at the end, to attach to student's robots.
Challenge 3: An 8' x 4' rectangle with 12" x12" squares in each of the four corners and a 6" x 6" square in the center of the mat. The red ball from the standard LEGO NXT Educator Robot can be used as the ball for the challenge.
Challenge 4: 60" x 60" platform with 3.5"x 0.75" x 32 ft wood for making the wall for the maze. Detailed dimensions are given in Appendix D.

IX. Scoring

Challenge 1: Speed

How Points are Awarded: Points will be awarded to the teams with the fastest times. The breakdown of points can be seen in the chart below. Times for each group will be recorded and sent to the scoring committee for calculation. Winners of the challenge will be announced once all teams have completed the challenge.	
1st Place (Fastest time out of all the teams)	50
2nd Place	40
3rd Place	30
4th Place	20
5th Place	10
6th-Last	0 points
Touching the robot while it is in play	Disqualification
The robot does not stop autonomously between the 15-foot and 20-foot markers	Disqualification

Challenge 2: Strength

How Points are Awarded: Points will be awarded to the teams that pull the most weight on the tension scale within a 10-second interval. The amount of weight pulled by each team will be recorded by the judges and sent to the scoring committee for calculation. Winners of the challenge will be announced once all teams have completed the challenge.	
1st Place (Pulls the most weight out of all robots)	50
2nd Place	40
3rd Place	30
4th Place	20
5th Place	10
6th-Last	0 points
Touching the robot while it is in play	Disqualification
The robot does not stop autonomously after 10 second time limit has elapsed.	Disqualification

Challenge 3: Accuracy

How Points are Awarded: During this challenge, students will receive points for completing the various aspects of the challenge. The team that procures the most points within the 1-minute time limit will be declared the winner of this challenge. Winners of the challenge will be announced once all teams have completed the challenge.		
1st Place (Team that procures the most points)		50
2nd Place		40
3rd Place		30
4th Place		20
5th Place		10
6th-Last		0 points
Individualized Scoring of Challenge 3		
Task 1	Retrieving the Red ball with the robot before disqualifying	10 points
Task 2	Successfully delivering the red ball to the 6" x 6" box in the center of the board, before disqualifying	10 points
Task 3	Successfully parking the robot within the correct end position, before disqualifying	10 points
Time (seconds) left on the clock from the allotted one minute (60 sec), if all the above 3 tasks are completed without disqualifying		(Varies) Example: If a team completes this challenge in 45 seconds and 15 seconds are left on the clock, then the team will receive 15 points toward their individualized score.
Touching the robot while it is in play		Disqualification
Robot leaves the boundaries of the playing field.		Disqualification

Challenge 4: Maze

How Points are Awarded: During this challenge, students will receive points for completing the various aspects of the challenge. The team that procures the most points within the shortest time limit will be declared the winner of this challenge. Winners of the challenge will be announced once all teams have completed the challenge.	
1st Place	50
2nd Place	40
3rd Place	30
4th Place	20
5th Place	10
6th-Last	0
Individualized Scoring of Challenge 4	
Completing the 1st segment before disqualifying	10 points
Completing the 2nd segment before disqualifying	10 points
Completing the 3rd segment before disqualifying	10 points
Completing the 4th segment before disqualifying	10 points

Time (seconds) left on the clock from the allotted one minute (60 sec), if all four segments of the maze are completed without disqualifying	(Varies) Example: If a team completes this challenge in 45 seconds and 15 seconds are left on the clock, then the team will receive 15 points toward their individualized score.
Touching the robot while it is in play	Disqualification
Robot hits walls	Disqualification

Overall Competition Winner

How Points are Awarded: The total sum of points from all four events will be added together to determine the winner of the competition	
1st Place	Highest number of points accumulated.
2nd Place	2nd Highest number of points accumulated.
3rd Place	3rd Highest number of points accumulated.
4th Place-Last	4th-last place highest number of points accumulated
Tie Breaker	The robot that successfully pulls the other team's robot over the line or the robot that is furthest from the line after 1 minute, if a state of equilibrium is reached.

X. Awards Ceremony

At the end of the competition day, students will participate in an awards ceremony. Participating Schools may receive only one award. All students who take part in the tournament will receive a certificate of recognition for their efforts in participating in the tournament. The top 3 teams in the competition will receive the following:

1st Place: a 1st Place trophy, in addition to **$150**, which their school can use to purchase technology for the classroom

2nd Place: a 2nd Place trophy, in addition to **$100**, which their school can use to purchase technology for the classroom

3rd Place: a 3rd Place trophy, in addition to **$50,** which their school can use to purchase technology for the classroom

Please note that a receipt of purchases must be e-mailed or faxed to NSU Engineering and Technology Department to verify prize monetary purchase was used for technology purposes otherwise you will be banned from participating in future events

X. Contact Information

Dr. Shahriar Hossain
Interim Head of the Department of Engineering Technology
And Associate Professor of Industrial Engineering Technology
Northwestern State University
Williamson Hall, Room 101
157 Sam Sibley Drive,
Natchitoches, LA 71497
Phone: 318-357-5026
Email: hossains@nsula.edu

Kenyetta D. Jackson
Administrative Assistant
Department of Engineering Technology
Williamson Hall, Room 101
157 Sam Sibley Drive,
Natchitoches, LA 71497
Office: 318-357-6751
Fax: 318-357-6145
Email: jacksonke@nsula.edu

Forms and Appendices

Letter of intent to participate in the Fall Robotics Competition at NSU NSU-RC&S^3 Nov. 29, 2023

Date: _____

School Name: _____

School address: _____

Are you PLTW School? _____☐Yes _____☐No

Number of participating teams: _____

Number of students per team: _____

Ages of Participating Students: _____

Number of participating African American students: _____

Number of participating Hispanic/Latino students: _____

Number of participating Native American students: _____

What kind of robot will you be using? _____

Point of Contact: _____

Email address: _____

Phone number: _____

The letter of intent and photo/press release forms should be sent to ***Dr. Shahriar Hossain*** via email at *hossains@nsula.edu* by November 24, 2023. The term "***RC&S3-fall 2023" should appear in the subject line for proper filtration.***

NORTHWESTERN STATE
UNIVERSITY OF LOUISIANA

Department of Engineering Technology

Media Release for Parent and Minor

I, _____ , am the parent/guardian/legal representative of
(Please print your name)

_____ and do hereby give permission
(Please print name of child)

for the above-named minor child (hereinafter "Minor") to be photographed and/or videotaped by NASA, STEM Pioneers, NSU or their representatives. I understand and agree that the photographs and/or videotapes containing the image and/or voice of the Minor may be used in the production of instructional and/or promotional materials produced by or on behalf of NASA, STEM Pioneers, or NSU (hereinafter the "Program") and that such materials may be distributed or broadcast to the public and displayed publicly. I also understand that my permission to use the photographs and videotapes is for an unlimited duration and that neither I nor the Minor will receive any compensation for granting this permission or for the use, if any, by NASA, STEM Pioneers, or NSU of the Minor's image and/or voice.

I acknowledge that NASA, STEM Pioneers, or NSU has no obligation to use the Minor's image or voice in connection with the Program.

I hereby unconditionally release NASA, STEM Pioneers, or NSU and their representatives from any and all claims and demands arising out of the activities authorized under the terms of this agreement.

By signing below, I represent that I am at least 18 years of age and am the parent/guardian/legal representative of the above-named Minor. I have read the foregoing agreement and am familiar with all of the terms and conditions thereof and I consent to its execution by the Minor. I agree that neither I nor the Minor will revoke or disaffirm this agreement at any time.

Signature of Parent/Guardian/Legal Representative of Minor:

_____ **Date:** _____
mm/dd/yyyy

Relationship to Minor: _____

Name and Location of Event: Robotics Competition and Smart Structures Show 2023, at NSU, LA

Signature of Minor:

_____ **Date:** _____
mm/dd/yyyy

Appendix

The following document is for teachers to use to set up their classrooms/robotics labs for the NSU Robotics Tournament. Please follow the guide in the directions along with the resources in this document to accurately set up your classroom to match the competition venue.

A. Challenge #1 Speed:

The speed challenge is conducted in a 2'x15' rectangular area. The robot will start as shown, with its wheels on the **START** line. Once the robot's drive wheels cross the 15-foot mark (**END** line) it must come to a complete stop before going over 20 ft. The 20-foot interval is marked with a third line. As soon as the robot comes to a complete stop, team members must call time for the judges.

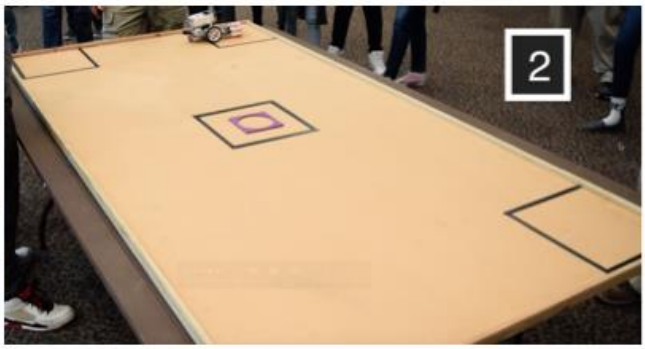
B. Challenge #2 Strength:

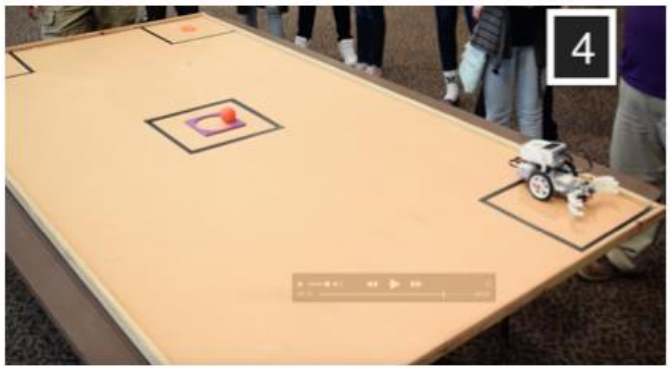
Robots will be hooked up to a digital tension scale to measure the strength that they pull. Digital scales (Mango Spot LCD Electronic Balance, Digital Fishing Hook Hanging Scale) can be purchased from Amazon for $8.99. These scales do up to 50 lbs or 50 Kg (digital). Robots will have 10 seconds to pull as much weight as they can on the scale. The judge will have to accurately watch the scale during the challenge to see how much weight is pulled. The digital scale will memorize the highest reading. Please keep in mind that the floor conditions can differ from the classroom and competition venue. Participants may use rubber bands around wheels to decrease slipping and increase adhesion to the floor.

You can hook the scale to the back of the robot via the attached hook.

C. Challenge #3 Accuracy:

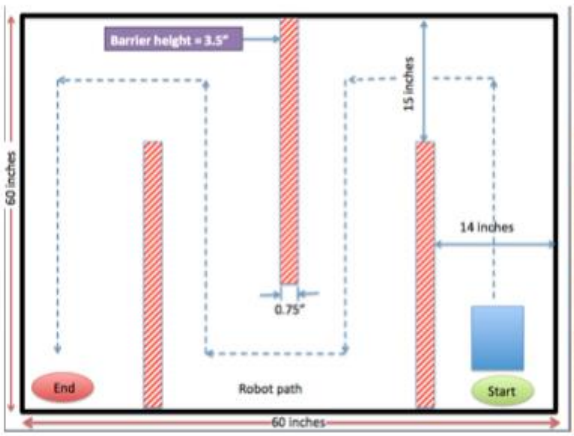
The accuracy challenge takes place in an 8'x4' area. Robots will begin in a 12"x12" square in the bottom left corner. Each of the 12" squares was created with black electrical tape (0.75" =~ 2 cm).



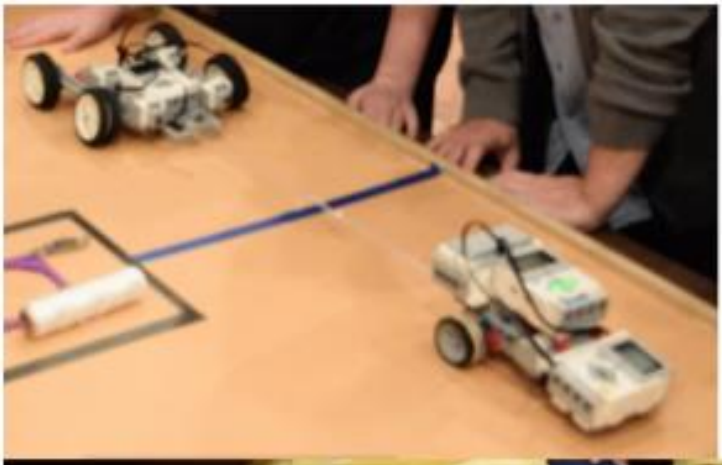


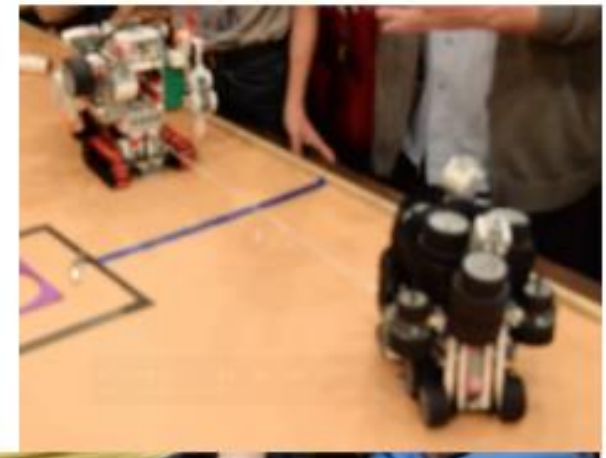
The robot will travel from the start position **(1)** to retrieve the ball in the top left corner **(2)**, then deliver it to the pedestal in the middle **(3).** Lastly, robots park completely within the top right square after delivering the ball **(4).** The ball is the standard red ball from the **LEGO NXT** kits, and the holder is made from 7m straight beams and 4 L-shaped connectors.

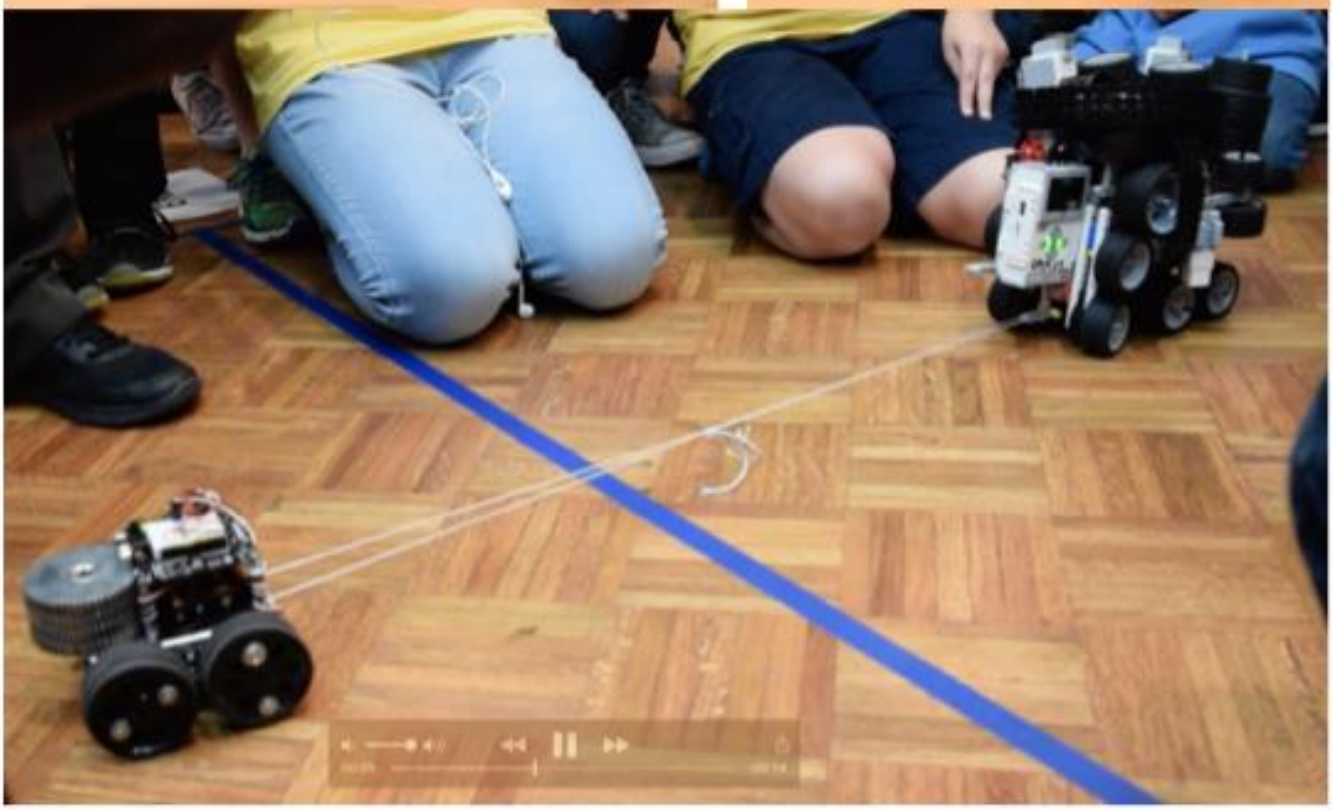
D. Maze challenge dimensions



E. Tie-Breaker







Components needed for 3D printing

All components designed and fabricated at NSU will be shared as STL files. This will allow participating schools to use a 3D printer facility to replicate components used in the challenges.

NSU Campus map

All competition activities will take place at the Student Ballroom at Friedman Student Union, RM# 206. Below is a link to an interactive map of the NSU campus. You may contact our department (318 357 5298) if you need help.

http://nsulamap.hostexp.com/#!UMAP_2012020264089%7CBLD_2012013111189%7B%22embedMedia%22%3A%22IMG_2012030151777%22%7D

http://nsula.hostexp.com/#UMAP_2012020264089

Change to Student Union Ballroom