

# Robotics

The purpose of this document is to give you general guidelines and procedures for how the Robotics Competition will work so that you can be prepared for the season. This document will NOT provide instructions to complete the robot, nor the rules of the competition.

## I. Divisions

We will have both a high school and middle school division. A middle school team is defined as a team with students from 5<sup>th</sup> to 8<sup>th</sup> grades and a high school team is defined as a team with students from 7<sup>th</sup> to 12<sup>th</sup> grades. High school students (9th through 12 grades) can only compete at the high school division level, while middle school students can compete at either the high school or middle school division level, at the school's discretion. A student can only register to compete in **one** division.

## II. Teams

A team may consist of 2-6 students. Experience has shown that 3-4 students per team is a good size. Each team must have its own robot; teams may not share robots during competition. Schools may have more than one team. Each school that registers by the registration deadline is guaranteed up to two high school teams and two middle school team slots in the competition, more competition slots may be available after the registration deadline on a first come first served basis. A maximum of 24 slots per division will be available for the 2017 / 2018 season.

## III. Kick Off

The Kick Off event will be a day-long event in which the specific rules for the competition, the game board design and the scoring will be announced. Kick Off is designed to be a fun event where mentors and students come together to get to know each other and have questions answered, view the game board and learn the competition rules. There is no competition during Kick Off. Kick Off needs to be as early as possible in the school year but no later than 6 weeks prior to Competition.

It may be beneficial to bring your robotics kit and laptop (and possible an extension cord and power strip) to Kick Off. There are always people willing to help new schools get started.

## IV. Competition

We will have a competition for both middle and high school divisions. A competition is a day-long event in which the teams from the schools compete for both team and school awards.

Each team will participate in a minimum of four placement matches. The top eight teams will compete in an elimination tournament to determine the placement. The elimination tournament will begin with two matches consisting of the 1<sup>st</sup>, 2<sup>nd</sup>, 7<sup>th</sup> and 8<sup>th</sup> teams and the 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> teams competing against each other. The top two from these matches will compete in a final match for 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> place.

The object of the competition is to score as many points as possible during each run of each match using programmed autonomous robots to place the scoring elements on the game board according to the competition rules. There will be multiple ways to score and an objective of the teams will be to determine the best strategy to score points using scoring zones, multipliers and bonus objectives using effective design, engineering and programming of their robot. Scoring methods will vary in complexity and most (if not all) will be designed to be accomplished with the use of a maximum of two sensors and simple programming decisions that can be accomplished with the included software of both the LEGO and VEX platforms.

The competition will be held toward the end of the school year preferably after sports seasons have ended. The competition will culminate with an awards ceremony where team members will be awarded individual 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> place medals and schools will be awarded State Champion and Runner Up trophies, per division. If a single school wins both 1<sup>st</sup> and 2<sup>nd</sup> places no Runner Up trophy will be awarded.

## V. Match

A match is a set of three 60 second runs where four teams/robots try to score points simultaneously. Before each of the three runs the robots will be placed in the starting zone and the game board reset according to the rules of the competition. During each run the robots may be restarted in the starting zone according to the rules of competition. At the end of the three runs the match is finished and match scores will be tallied according to the rules of the competition. Match scoring will be as follow:

- First: 4000 + points scored on game board
- Second: 3000 + points scored on game board
- Third: 2000 + points scored on game board
- Fourth: 1000 + points scored on game board

During a match only three students per team may be at the game board at a time. If a team has more than three students then they may swap positions between runs.

## VI. Game Board

The game board is the field on which the competition is played. Game boards will be different each year and will be played with different scoring elements, layouts, multipliers, bonuses and rules. The game board will be a white 8' X 8' field with the perimeter of the field bounded by a 1"

black border. The game board has four color coded starting zones connected to the outside of the field of play. Competing teams will have a designated starting zone at the beginning of each match. Other elements of the game board will be defined in the competition rules.

## VII. Starting Zone

Each robot/team will start a match in a designated starting zone. The starting zone will be a 12” X 12” connected to the game board. The robot must fit completely within the bounds of the starting zone (this includes attachments and wires; nothing can hang over the sides of the starting zone.) The maximum height of the robot will be determined by the competition rules.

## VIII. Competition Rules

The competition rules vary year to year, as do the scoring elements, rules and game board design; as such these rules are not defined in this document. The competition rules will be published as soon as possible but no later than Kick Off. The rules committee is responsible for the specific rules of the competition each year. The competition rules govern the scoring, game play, game board design, and interaction of the robots on the game board.

### Robots

Robots may be built from one of the following platforms:

- LEGO EV3 (<https://education.lego.com/en-us/middle-school/shop/mindstorms-ev3>)
- LEGO NXT (older model)
- VEX IQ (<https://www.vexrobotics.com/vexiq/products>)

In addition to the robotics kits listed above, the following parts may also be used in the construction of the robot:

- Any non-motorized LEGO part (standard or Technic)
- Any non-motorized VEX IQ part
- Most 3rd party sensors compatible with LEGO or VEX (note - a sensor from an older platform may be used with a newer platform, as long as physical modification to the sensor is not necessary)

For a part to be permissible, the following must be true:

- It must be commercially available (Any team can buy the part / sensor in an unmodified form)
- It must not break the 4 motor, 4 sensor, 1 battery limit.
- It must not require an adapter, glue, tape, or adhesive to make work with a particular

platform

- It must not require modification to work with a given platform
- It must not be able to be used for remote control -- even if the team did not install it for that purpose. These include (but are not limited to) IR sensors and sound sensors.

Robots must be contained entirely within the starting zone (this includes any cables and attachments) and meet any height requirements defined by the competition rules at the beginning of each start during a match run. Robots can be modified at any time during the competition, including during a run, but still must be contained entirely within the starting zone.

During a match the robot can have at most four motors and four sensors. More can be brought to the match and swapped as the team desires, but only four of each at a time may be connected.

After competition rounds begin, all robot programming must be limited to a physical cable; any wireless connectivity to the robot such as WiFi, infrared or Bluetooth is prohibited.