

# 2009 Engineering Expo Robotics Competition Rules

Revised February 6, 2009

## Competition Summary

This year's Engineering Expo Robotics Competition will be a tournament consisting of several free-for-all matches between competing teams' remote-controlled robots. Robots will enter the court and engage in a free-for-all robotic game similar to basketball. The duration of the match will consist of five minute halves with a half time in-between. The halftime can be used to tweak or repair your team's robot. The playing field has two buckets that can be scored by competitors. There will be balls initially on the playing field and balls will continue to enter the playing field during the duration of play. The team's goal is to push or carry balls to either bucket and somehow place the ball in the bucket to score. The game also contains a defensive segment. Minor physical contact is allowed in an attempt to prevent your opponent from scoring. At the end of the game each team's points *and* penalties will be applied towards their overall score.

Only one robot can be registered per team.

## Court and Gameplay Description

The court will be rectangular in shape with two goals, each with an elevating path leading up to it region to score. Each ramp will be at a 10 degree incline. The simpler of the goals will be located in a corner of the course with two ramps leading up to a platform where there is a hole to score in. This goal is only worth one point. Each of these ramps will be a conveyor belt so that the ramp will be moving. One ramp will initially be moving in the upwards direction to help robots up the ramp and the other ramp will be moving in an opposing motion to make it increasingly for a robotic to climb up to the platform. The conveyors will always be traveling in opposing directions, however, there is a way to change the directions of the ramps found within the course. This can be used to your advantage or can be used against you by your opponent. The second and more difficult goal is located on a raised platform about a foot off the course that can be reached by traveling up a ramp. This ramp will not be moving and will be easier to climb. Once arriving at the top of the platform though, there will be some obstacles hindering your ability to reach the goal. For your trouble this goal will be worth three points. The ramps will be at least 30 inches wide and 3 feet long (conveyor ramps), and the goals themselves will both be approximately 10 inches wide and set flush with the platforms at the top of each ramp. A detailed drawing of the course is available on Engineering Expo 2009's website and will include approximate dimensions of the ramps and goals.

There will initially be enough tennis balls in play on the court so that each team can retrieve a ball. Whenever a ball is scored or otherwise removed from the game, another ball will be placed on the court in a neutral location. Each team's goal is to retrieve these balls in play and navigate to either of the mentioned buckets and score. After placing the ball in the goal, the robot will return down the ramp and proceed to pick up another ball, continuing until time runs out. There will be a marked area called *the crease* that surrounds each goal. Contestants will *not* be allowed to be in this area for more than 3 seconds, *unless* attempting to score. There is a one point penalty for every three seconds of excessive goal tending. Robots are allowed to pick up a ball using a method that will only hold the *ball and not puncture or pierce the ball*. However, if the team is unable to dispense the ball from their robot they will not be able to gather any other balls as each team can only possess one ball at a time. On top of this rule, robots are allowed to hold a ball and simultaneously push a ball at the same time. If there are any questions on devices to hold balls please contact Sayeed or Ryan. Contact information is listed below.

During the competition, the clock will not be stopped until the half except in an emergency, and nobody is to enter the court during game play for any reason unless instructed to by a judge or a Chair. If someone were to enter the court during game play without being given permission, their associated team will be automatically disqualified from the round. Penalties will be announced as they happen and as many times as they happen, which means that a team could potentially get a negative final score. Teams are penalized by a deduction from their score. In the event that a robot is disabled during the competition, time will be stopped and the disabled robot's team will be given a brief amount of time to collect their disabled robot. Then time will be restarted and game play will continue. If the disabled robot is repaired with time left on the game clock, they must signal a judge. Time will be stopped again for reentry, and will resume again after all contestants are clear.

### **Modification Period**

There will be a 5 minute modification period before each half begins, during which small modifications may be made by each team. At either the judges' discretion or a request from the opposing team, a robot may need to be re-weighed and measured before it may compete again. If a robot does not meet specifications at the end of the modification period, no further modification time will be allowed and the team must either accept a penalty, if applicable, or may be disqualified from the round. A robot may also be modified or repaired when it is not actively competing, but must always be present and ready to be re-weighed and re-measured when it is its turn to compete.

### **Tiebreakers and Overtime**

In the event of a tie, the team with fewest penalty points will be declared the winner. If there is still a tie, a five minute overtime round will determine the winning robot. In the overtime round, robots play both offense and defense simultaneously with 3 balls on the court, and the team with more points at the end of the round is declared the winner. If the scores are even at the end of the round, the round will continue as sudden death until one team either scores, thus winning the round, or gets a penalty and loses the round. Prior to entering overtime, there will be a standard modification period. If a robot is disabled or otherwise unable to compete at the end of the modification period, it may be disqualified by the judges. Additionally, a team may also choose to forfeit the overtime at any time, even after it begins, if their robot is disabled or for any other reason.

### **Acceptable Contact**

During the game, contact is encouraged within friendly and reasonable limits. If the judges consider a robot to be excessively rough or to have intentions beyond keeping the other team from scoring points, a penalty will be applied to their final score. If excessive or unnecessary roughness, at the judges' discretion, disables another robot of sturdy construction, it will result in disqualification. However, if a robot is unintentionally disabled due to an acceptable amount of contact, there will be no penalties.

### **Robot Specifications and Requirements**

- Each robot must fit within a 24" cubic box to avoid penalties. Any length/width/height or diameter (if applicable) over 26" will result in a disqualification.
- Any extensions of the robot must be in the "closed position" when being measured.
- Each robot must weigh 50 lbs or less to compete without penalties, and will be disqualified for weights over 60 lbs.
- Robots must at least have bumpers around 75% of their perimeter with a contact edge along a plane 4 inches above the ground. Bumpers must include some collision dampening material, such as foam and have no sharp edges or contact points.
- Each robot must be completely cordless, and be controlled by remote, autonomous, or a combination, and have an easy access emergency stop button or switch located on the robot.
- Only team members may control a team's robot during the competition. During any given half, the controller may not be changed for any reason.
- All voltage sources must be shielded. Only lead acid, NiMH, NiCd, and Alkaline batteries are allowed (no lithium ion for safety reasons). Pneumatic and hydraulic lines must be kept under 100 and 200 psi, respectively, and shielded for burst protection.

- No lasers, projectiles, open-to-air electrodes, radio frequency jammers, flammable components, or EMPs will be permitted for any reason.
- All robots made by high school and college teams must be entirely student built.

### **Penalties and Deductions**

Penalties will be assessed by the use of cards, and the play clock will not be stopped—except for disqualifications. 2 point deduction penalties will be signaled with a yellow card, 3 point deductions will be signaled with an orange card and all disqualifications will be signaled with the red card. Teams will receive one card per penalty, and all cards (and point deductions) will be subtracted from the team's total score at the end of each match.

- Size infractions: 1 point will be deducted for any dimension that is over the 24" limit, with an additional 1 point deduction for every inch over (for example, there will be a 2 point deduction if a robot is 25" tall). In the case of a round robot, diameter infractions are double points off.
- Weight infractions: 1 point deduction if over 50 lbs, with an additional 1 point deduction for every 2.5 lbs over the limit.
- Unnecessary Roughness: 1 point deduction for each infraction.
- Unsportsmanlike Conduct: 2-3 point deduction for each infraction, at the judges' discretion. This includes excessive goal tending, bullying, offensive language, or excessive taunting.
- Intentional Destruction of Balls or Court: 3 point deduction for each infraction.

### **Questions**

Questions and comments regarding the rules and clarifications of them should be sent to Ryan Fallon ([rfallon@wisc.edu](mailto:rfallon@wisc.edu)) and Sayeed Ahmed ([sahmed1@wisc.edu](mailto:sahmed1@wisc.edu)), the competition managers. These rules may be updated before the competition, in which case all registered teams will be emailed a new copy, and the new rules will be posted at <http://engineeringexpo.wisc.edu/index.php/robotics>.