International Autonomous ROBOT RACING Competition (IARRC) 2018
http://robotcompetition.ca/

Updated Rules - July 12

Basic Qualifications

Teams will be awarded points for Basic Qualifications. 25 points will be awarded for static aspects of the Basic Qualification such as respecting max dimensions, placement of e-Stop button, etc, and another 25 points will be awarded for dynamic aspects, such as moving under control, working e-Stop mechanisms, etc.

Drag Races

To qualify for the Drag Race, teams need to demonstrate that their vehicle meets the Basic Qualification expectations which includes demonstrating that their vehicle can drive forward for 10m under control, and then stop within 5m. This should be done by the Friday 21:00 deadline, but can be done in the Saturday 07:30-08:30 Late Basic Qualification window.

There will be 3 rounds of Drag Races. All the qualified teams get a slot in each of the first two rounds, and the best four (4) teams qualify for a bonus round. Each round will be scored individually, and vehicles must do one round in the left lane, and the other in the right lane. The first two rounds are worth 50 points each, and the bonus round is worth up to 20 points for 1st, 15 points for 2nd, etc. The bonus round does not allow for penalties, so if a vehicle incurs a penalty or does not finish, it does not get any bonus points.

Circuit Races

After the Drag Races are complete, the Circuit Track will be available from 11:30-13:30 for Circuit Qualifications. Vehicles must complete at least 2 turns (pass the qualification line indicated by judges) to qualify for the Circuit Races, and the time they take to complete a full circuit will be used to to make the heats and choose starting positions.

There will be 2 Circuit Races on two tracks. The first race will be on the Classic Track with typical difficulty level, and the second race will be on the Easy Track - the Classic Track after some turns have been removed. Team do not need to participate in both, but they need to do the classic to be able to try the Easy Track - no skipping the hard part! Teams that only do the classic race will be scored out of a total of 200, and teams that do both will be scored out of 100 for each race - unless this gives a score lower than the first race. Races will have two rounds, worth 50 points each. All the qualified teams get a slot in the first round of each race, and the best 4 vehicles move to the finals.

Penalties

The penalties have been adjusted to have clearer and fairer definitions:

- **START PENALTY** (formally false start): A multiplier (1.2) penalty will be applied for: 1) if the robot goes early, 2) not going automatically (ex: manual trigger), 3) needing to move robot after the start for it to see the light.

- **EXCURSION** (formally course departure): A multiplier (1.5 for drag, 1.2 for circuit) penalty will be applied for every excursion from the track. Team must replace any displaced objects, and the robot must be reset before the start of the turn.

- **PIT STOP**: A multiplier (1.1) penalty will be applied for each time a human needs to intervene because the robot becomes immobilized, goes the wrong direction, or does not stop at end. Nudging the robot to get it moving again is not allowed, but adjusting its orientation is allowed.

- **VEHICLE COLLISION**: A multiplier (2.0) penalty will be applied to a vehicle deemed (by the judges) At Fault of causing a collision with another vehicle. Unintentional soft bumping and "fender bender" type incidents will be ignored if they do not significantly change the race outcome. High speed rear-ending a stopped vehicle is At Fault. If an At Fault collision occurs, the not at fault vehicle will have a factor of 2.0 removed (divided) from their penalties, but cannot bring the cumulative penalty multiplier lower than 1.0 (a.k.a. does not make their team time faster than their finish time). The judges will decide if the vehicle at fault poses a risk to the other vehicles, and whether or not it can continue.

- **TIMEOUT** (replaces Lack of Progress): A time limit (5 min for drag, 20 min for circuit) will apply to each race. Vehicles that do not complete the race in time will get a Incomplete / Did Not Finish - DNF, and their progress as a percentage of distance will be recorded and used to calculate their score.

- In the event of multiple penalties being applicable (excursion and vehicle collision), the single worst penalty shall be applied.

Complete Scoring

The score of teams that complete the Races will be calculated by first multiplying their finish time by the penalty multipliers, and converting this time into points.

$$T\_team = Time\_Finish * \Pi\,(penalties)$$

Scores will be calculated as follows, where *T_fastest* and *T_slowest* are the fastest and slowest values of *T_team* for vehicles that completed the race:

$$Scored\_Points = Possible\_Points * \left(1 - \left(\tfrac{1}{2}\right)\sqrt{\tfrac{(T\_team - T\_fastest)}{(T\_slowest - T\_fastest)}}\;\right)$$

Therefore the fastest team get full points, and the slowest team get half points.

Incomplete / DNF Scoring

Vehicles that do not cross the Drag Race finish line, or do not complete 3 circuits of the Circuit Tracks, will be awarded points proportional to the percent distance completed (minus the penalties as percentage points), up to half of the possible points for the race.

Completing 20% of the Drag Race with no penalties gives a score of 20% * 25 points = 5 points. Completing 90% with penalties of 5 is 21 points. Completing exactly 2 laps of a Circuit Race gives a score of 66% * 50 points = 33 points. Completing only ⅔ a lap with penalties of 3 is (22% - 3%) * 50 points = 10 points.

Overall Scoring

The scoring points are now distributed as follows:

Written Report	50
Video Report	50
Oral Presentation	50
Basic Static Qualification	25
Basic Dynamic Qualification	25
Drag Race 1	50
Drag Race 2	50
Drag Race Finals (Bonus)	+20
Circuit Race 1 (Classic)	100
Circuit Race 2 (Easy)	100
Grand Total	**500**