



NXP Cup
Intelligent Car Racing

The NXP Cup Official Rules

Season 2026/2027

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Introduction

The spirit of the game is that students demonstrate excellent hardware integration and superior programming.

The NXP Cup 2025/2026 is a brand-new season focused on simplifying the challenge to allow students to focus on learning, fun, and great performance. All legacy Model-C, Alamak, DFRobot and MR-BUGGY3 cars are allowed as well as any other car kit if the electronics are within the rules.

Participants can use the broad range of NXP's technology solutions including MCUs, MPUs and Sensors.

Also, regardless of the board(s) and electronic configuration of the car, car size, motor type, all teams will compete in the same group.

Conditions and Enrollment

Teams must register online to participate. The registration opens in Summer 2025 and closes in January 2026. Link to registration can be found on

www.nxpcup.nxp.com

- Team member count must be 1 (one), 2 (two) or 3 (three)
- Each team member must be a student, middle-school, high school, undergraduate or graduate. Students enrolled in the challenge can be in any field of study. Students of all grades can team up as they wish as long as the number of students per team is within the rules. Team members can be a mix from middle-school, high school, undergraduate or graduate program or all the same group. Only one car is allowed in the competition per team.
- All registered teams will compete in the same race regardless of the education grades of the students composing the team
- Validation of the eligibility of the students (middle-school, high school, under-graduate or graduate) will be done through the registration process. Students may be asked to provide proof of student status to access the qualification events
- It is recommended that each team have a faculty coordinator. If a team chooses not to have one, they must designate a team member as team coordinator for receiving racing notifications
- It is forbidden for non-student to support the team to build and program the racing car

- Participants, advisers, and audience are expected to exhibit good sportsmanship. Any inappropriate behavior or cheating may result in disqualification

Equipment requirements

Each team shall use a car kit and boards as described below. The following requirements are in place to keep the playing field level. If any standard component of the car model is damaged, then a replacement part of the same model should be used.

Participants can use:

- The 2025 3D-printed car kit provided by NXP. More info available on [Gitbook](#).
- An existing NXP Cup car kit from previous seasons (NXP Cup Buggy, DFRobot model 2019, 2020, Model-C or Alamak)
- Acquire a commercial kit (Please consider the track sizes when choosing the size of your car!)
- Build their own kit (example: 3D-Print, wood laser cutting, Lego...)

For all car kits, the following requirements must be respected:

- The car can be propelled by up to 4 motors, brushed or brushless. When 2 or more motors are used, they can be on the same axle (one motor for the right wheel, one motor for the left wheel and so on) or each on a separate axle (one motor for the front axle, one motor for the rear axle)
- The car must have maximum 4 wheels. Tricycles or 2-wheels balancing vehicles are allowed into the challenge. The only contact points with the track should be the wheels. Any other contact points will be considered as wheels (eg. ball caster).
- Participants are allowed to use any NXP MCUs or MPUs (such as i.MX) or even the combination of the two. All boards must be NXP brand boards or powered with an NXP brand MCU / MPU. Students may create custom boards in addition to the boards provided in the default kits

- Any board modification (from a purchased board) or creation must follow the same rules as stated below and provide a detailed technical report including Bill of Material (BOM). The restrictions for modifications or creation of new electronics are:
 - The default camera can be changed. Any camera used must either be equipped with a NXP MCU / MPU or no embedded MCU / MPU at all (direct connection to the MCU/MPU board via SPI). Cameras that include a non-NXP MCU/MPU may also be used, and that the camera's sole function is raw image acquisition with no onboard processing beyond basic image transfer. Users shall not modify, program, or execute any custom code on the embedded processor on the camera. On request, information and specifications must be available to the referees.
 - The MCU(s) and/or MPU(s) on the board must be of NXP brand.
 - More than one processing unit can be used on the car
 - The car must use an optical sensor (camera) for primary navigation. Additional sensors can be used to improve the management of the surroundings of the vehicle
 - The car must be autonomous and cannot be remote controlled. During the race and the challenges, the car cannot be fitted with any wireless connectivity. Connectivity is allowed only during training sessions to help monitor the vehicle and run diagnostics during the development. When it comes to the official race, all laptops and other mobile devices have to be removed from the event space. This can include putting all IT equipment into bags and store them away from the race circuit. Using a computer to debug the vehicle ahead of the official race is not permitted. In case the vehicle has a WIFI connector, this must be unplugged.
- Participants can add as many sensors as they want on the car. NXP sensors must be used when such sensors are available on the NXP product line card. Please consult Mouser.com or consult with the NXP Cup Management team in case of questions or doubts. Here are some examples of sensors that can be used:
 - IR transmitter/receiver
 - CCD sensors
 - Hall effect sensors

- Encoders
- 3-axis sensors
- Optical sensors
- Ultrasonic sensors
- Gyroscope sensors
- Lidar sensors
- If required, participants can add a commercial Electronic Speed Control (ESC) module to help manage motor performance. ESC modules must act as a black box and be used as it is. No programmable ESCs are allowed unless it has an NXP controller inside, no flashing of the ESC is permitted. Only setting the parameters is allowed (eg. acceleration aggressiveness or braking strength). When an ESC is selected, information and specifications must be available to the referees on request.
- Battery requirements:
 - The battery shall be used to power the vehicle and any attached hardware
 - Rechargeable NiCd, NiMH, Li-Ion or LiPo (Lithium Polymer) with a maximum rating of 6000 mAh and a maximum voltage of 13V
 - Using voltage boost modules to increase the battery's voltage beyond 13V is not permitted.
 - LiPo batteries are allowed but participants must ensure they travel with LiPo special and authorized packaging. A separate area for battery charging will be created during the NXP Cup events. LiPo batteries can be charged only in the specific and designated areas. Batteries must be moved to the garage and race floor only in the approved safety packaging. Careful: special regulations are in effect for traveling with LiPo batteries. Consider verifying those conditions to be able to attend the racing events before acquiring your kit and batteries (see FAA rules)

Use of artificial intelligence:

Participants are encouraged to explore and implement Artificial Intelligence (AI) techniques to enhance the performance of their NXP Cup vehicles. AI may be used for tasks such as lane detection, obstacle avoidance, decision-

making, or adaptive speed control using methods like machine learning, computer vision, or neural networks. The use of AI is generally permitted as long as it operates within the constraints of the provided hardware and complies with safety and fairness guidelines.

Dimensions of the vehicle:

There is no size limitation on the car kit however, it is highly recommended to ensure that the chosen car kit can handle the turning radius of the track to respond to the requirements of the challenge. Please also check the NXP Cup track dimensions to ensure your vehicle can pass steeper curves.

The rules apply to all vehicles entered into the challenge regardless of their make or size. No exception will be granted.

Support structure for the NXP Cup

The following locations are available for technical and program support to all the participants:

- A [Gitbook](#) has been created to help support participants during the challenge
- A Discord server is implemented to serving as a communication and exchange hub. <https://discord.com/invite/3cdhBjpbAq>

Vehicle Technical Inspection

Before the timed race, the judges will perform a technical inspection of all entries. This includes vehicle specifications, dimensions, and equipment requirements listed in this document.

All cars must be placed in the inspection area on or before the designated time prior of the timed race.

Once in the inspection area, you may not touch car until you are called to race. The car can only be removed from the inspection area upon approval from the race management. No repairs or modifications can be made on the Inspection Area. However the batteries can be charged while cars are in inspection and added to the vehicles before the official races.

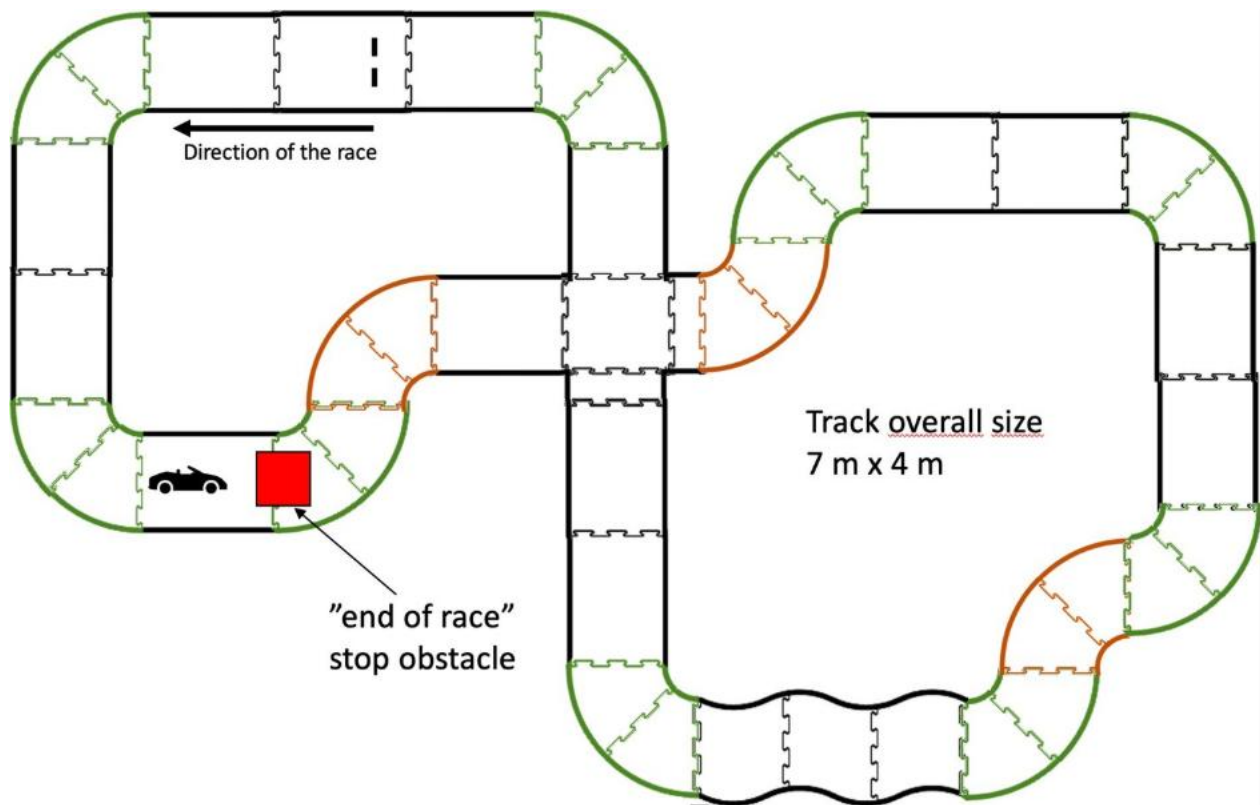
The judges might request to check the software used on the vehicle and to reprogram the MCU or MPU at this time.

In the event of any violations, the organizing committee is entitled to disqualify the corresponding team.

Racing Procedure

The timed race includes speed, precision, and reliability. Once the car has started on the racetrack and passed the 2 first curves, an “end of race” stop obstacle is placed on a straight section of the track.

The racecar must pass the end of race start/stop line, significantly lower its speed, and continue to drive until stopping within 10 cm, without touching the white obstacle that has been positioned somewhere on the racetrack.



Above: Example of event racetrack layout

The "end of race" stop obstacle is a white cube (made from Styrofoam or similar) with dimensions of 20x20x20 cm placed in the middle of the racetrack once the car has done the initial pass during its 1st lap.

The race start order will be determined by a random drawing. The random order is to be communicated before the race to the participating teams for the on- campus event.

The track layout will be communicated only shortly prior to the event by the event organizers at the campus. No training on the disclosed track layout is allowed.

The teams will race on the same racetrack layout regardless of car model and team members' composition education grades.

When the team is called, one (1) team member may remove the racecar from inspection area and has two (2) minutes to prepare the car. These following actions are allowed during the preparation time:

- Configure parameters via on-board interfaces. (Switches, Knobs, etc.)
- Alter the angle of the camera
- Change the battery
- Clean the wheels

It is not allowed to connect the racecar to any computer devices to upload, reconfigure or change any part of the programming on the racecar.

The race car needs to be placed at maximum of 30 centimeters (or less) in front of the start line.

After the referee confirms "Ready", the vehicle should leave the starting area within 30 seconds.

The team has three (3) attempts to complete one (1) lap. The first (not the best) completed time will be recorded. For example:

- Attempt 1 – Vehicle goes too fast around a curve and goes off track. Time is not recorded.
- Attempt 2 – Vehicle makes it around track successfully. Time is recorded.
- Attempt 3 is forfeited because FIRST close loop time has been recorded (in attempt 2)

After each attempt, the same team member has two (2) minutes to make approved adjustments to the vehicle. This team member can speak to the other member to align on the changes.

Once all the attempts have been done and the team has recorded a time, the team member must return the vehicle to inspection area.

- 1) Teams are allowed to test their cars on test tracks in the room in which the main event will be organized. Team members can attend the training session at the same time on the following tracks:
 - a. Test track for end of race stopping
 - b. Speed test track(s) with timing system installed
- 2) 60 minutes prior of the start of the timed race event, all team's cars must be put into technical inspection for compliance with the rules
- 3) All students and team members are asked to leave the event room premises
- 4) Once the finals track is built, teams are allowed to enter the room but cannot access their cars to test
- 5) The procedure for the timed race is followed by NXP Cup Management
- 6) Final scoring is done based on the scoring system documented into these rules.

Timing/Scoring

The timed race lap time is captured using an electronic gate and/or hand-held timer. Time starts and ends when the first part of the racecar passes the start/finish line.

Scoring Procedure

A scoring spreadsheet will be provided for each event to document the performance of the participating teams.

The champion team is the one that accumulates the highest number of points.

That score will be added to the score of the timed race based on the following ranking:

Fastest time	2nd fastest time	3rd fastest time	4th fastest time	5th fastest time	6th fastest time	7th fastest time	8th fastest time	9th fastest time	10th fastest time	11th fastest time
650 points	550 points	450 points	400 points	350 points	300 points	250 points	200 points	150 points	100 points	0 points

The bonus of 150 points for slowing down and stopping within 10 cm in front of the “end of race” stop obstacle Mouser lap of honor is added to the points for each team if applicable.

In case of parity in points between more than one team, the winning team is the one that has the fastest time on the speed race. Only one team will be crowned the NXP Cup Champion.

Fouls, Failure and Disqualifications

NXP and the organizing committee of the event will interpret the rules as needed in case of conflict.

Foul is a minor infraction, which results in time penalties.

Failure results in the current attempt lap time not recorded.

Disqualification is a major infraction that no result times will be recorded.

During the race, referees will determine whether the racing car ran out of the racetrack and assign time penalties.

Any of the following conditions qualifies as a foul and result in time penalty added:

- The racecar fails to leave the starting area within 30 seconds after beginning of the race [+2 seconds].

Any of the following conditions qualifies as a failure and no race time is given:

- More than 51% of its total number of wheels lose contact with the track.
- The racing team fails to get prepared for the attempt within the two (2) minutes allotment
- The team member handles/touches the race car after the technical inspection without consent of the referee
- The race car fails to reach the finish line within 120 seconds after leaving the starting area
- The car will not exit the intersection through the opposite side from where it entered.
- The team member touches the car at any time between start and finish as "Start" is once part of the racecar crosses or partially crosses the starting line and "Finish" once the vehicle crosses the finish line.
- During an attempt, team members are not permitted to touch, handle, or remove the vehicle from the track for any reason. If a team member intentionally intervenes by touching or removing the vehicle before the attempt has been declared successful or failed, the team will be disqualified from the current attempt and all remaining attempts. The vehicle may only be touched or removed once the attempt has been officially completed, either through successful completion of the course or after the attempt has been declared failed.

Any of the following conditions qualifies as a disqualification and all registered scores will be nullified:

- Any of track equipment or behavior that may influence or impede cars
- Making modification to the racecar any time after the technical inspection
- Any cheating during the competition
- Failure to pass the technical inspection

Equality and fairness are ensured as much as possible on the condition of actual feasibility. Disputes will be resolved by a vote of NXP members of the organizing committee, and judges.

The Race Track

Test tracks can be laid from track elements unused on the communicated racetrack in an adjacent room with similar lighting conditions. The actual layout of the tracks for the Obstacle Avoidance Challenge and Timed Race are unknown to the competitors the time of each challenge. The racetrack specifications are as follow:

- The width of the race track is 55cm
- Material and dimensional specifications are listed [here](#)
- Surface of the racetrack is matte white with a continuous black line (2cm) on each edge of the track
- The racetrack can intersect with a crossing angle of 45° and 90°.

Event Personnel

A committee of NXP people (organizers, engineers, HR) will be in contact with the on-campus organizers during the on-campus event to help with event coordination and mediate and resolve any disputes.

The NXP Cup organizing team will name on-campus referees. They are responsible for on-track activities. This can include racetrack management such as starting and stopping vehicles, as well as video recording, timing and scorekeeping.

The Event Personnel shall not aid or give favors to any one specific team. Communication shall be open to all teams and shall not disclose any information that might compromise the fairness of the competition.

Contact Information

The organizing team is composed of the following persons:

Gina Wintrich: gina.wintrich@nxp.com

Matthias Wilkens: matthias.wilkens@nxp.com

Legal Clause

The rules and conditions are subject to change by NXP if necessary. NXP reserves the right in their sole discretion to cancel, suspend and/or modify The NXP Cup race at any time.

These official rules are drawn up in the English language. If these official rules are provided in any other language and there is a conflict in the text, the English language text shall prevail.

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