The Freescale Cup

2015 EMEA Challenge Rules

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freescale™
University
Programs

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

Section 1: Team Requirements

Four person maximum team size.
A team may have only one graduate student.
Cars will be designed and constructed by students ONLY.
Participants are expected to exhibit good sportsmanship. Any inappropriate behavior or cheating may result in disqualification.

Section 2: Event Registration

Entrants into the EMEA challenge must be associated to a university or student association.
Registration into the event must have been done (Results+ registration system) and accepted

Section 3: Equipment Requirements

Each team shall use the same basic kit of parts as described below. The following requirements are in place to keep the playing field level.

Mechanical

1. The original and unaltered equipment must be used in the entry.
    a. Tires
    b. Drive - DC motors
    c. Transmission Ratio of Drive Motor
    d. Servo Motor
    e. Battery (purchase separately)
        i. 7.2V, <=3000mAh, rechargeable NiCd or NiMH
        ii. Only one (1) battery at a time may be used to power the vehicle and any attached hardware
    f. If any standard component of the car model is damaged, then a replacement part of the same model should be used.
2. The chassis can be modified, with some restrictions:
    a. The footprint of the frame may not be altered
    b. You may not change the distance between wheels
    c. No part of the car shall exceed dimensions of 250mm/9.85in (W) x 400mm/15.75in (L)x 305mm/12in.(H)
    d. You may drill holes and mount auxiliary pieces on the chassis assuming it is contained within the above dimensions.

Electrical

1. You may create custom boards and are not required to use the provided Freescale development board(s).<Let's talk to the team tomorrow morning>
2. The electronics can be modified, with some restrictions:
    a. A Freescale 32-bit MCU must be used.
    b. One processor - No auxiliary processor or other programmable device is allowed.
    c. The car must use a optical sensor to navigate
    d. DC-DC boost circuit may not exceed battery voltage.

e. Total capacity of all capacitors should not exceed 2000 uF; the highest charging voltage of capacitors should not exceed 25 V.

3. Sensor Limits
    a. You may use additional cameras.
    b. Maximum of sixteen (16) sensors
        i. Examples of sensor count:
            - IR Transmitter/Receiver pair is 1 sensor
            - A CCD sensor is 1 sensor
            - The provided Line Scan Camera is 1 sensor
            - A hall effect sensor on two rear wheels is 2 sensors
            - An encoder mounted on one wheel is 1 sensor

More information about authorized hardware and software is available on the Freescale Community at https://community.freescale.com/docs/DOC-1284

Section 4: Technical Report Requirements

Technical reports will be reviewed and rated by the experts invited by the organizing committee of the event. Technical reports should be clear with detailed text, diagrams, and bibliography. Technical reports must contain a brief description of major concepts and specific technical implementation schemes for design and production of vehicle models including:

1. Description of mechanical design of vehicle model
2. Description of control circuit design
3. Description of the electronics design
4. Description of control software design
5. Total weight and dimensions of the reengineered vehicle
6. Power consumption
7. Count and type of sensors used
8. Number of servo motors besides the existing driving motors and rudder motors of the vehicle model
9. Written in English
10. Formatted as PDF

Technical reports are required as follows:

- Qualification race: electronic or printed form upon request during the Vehicle Inspection
- EMEA Finals race: Submitted by email electronically to the organizers of the race at least 2 weeks prior of the race. In case of any modifications between the time of submission and the Vehicle Inspection, **an updated printed report** must be on the Vehicle Inspection table along with the racecar.

Section 5: Vehicle Inspection

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

All cars must be placed in the Inspection area on or before the designated time.

Once in the Inspection Area, you may not touch car until you are called to race
In the event of any violations, the organizing committee is entitled to disqualify the corresponding

team.

Section 6: Qualification Races

Some regions within EMEA might organize qualifying races to select the top teams that will be attending the EMEA Finals.
The same racing rules apply to the regional qualifying races as to the EMEA Finals.
Qualifying races are planned as a 1-day event with training session in the morning, inspection at 12:00 (noon) and race in early afternoon.
Selected participating universities will organize the qualifying races on their grounds using either their own racetrack and timing system (validated by Freescale) or by using a Freescale authorized racetrack in loan to the university.

The regions are set as follows (may vary depending on participating countries):

- Italy, Spain and Portugal
- France and Switzerland
- United Kingdom
- Germany, Benelux, Austria
- Poland, Czech Republic and Republic of Slovakia
- Russia and Ukraine
- Romania, Bulgaria and Greece
- Tunisia, Morocco and Algeria
- Sweden, Finland, Norway and Denmark

If a qualifying race has less than 10 participating teams, it might be merged with another region's qualifying race.

The top winning teams of each qualifying race qualify for the EMEA Finals. There is no limitation of number of teams qualifying for the EMEA Finals per university or faculty.

The exact number of top teams qualifying for the EMEA Finals during each regional qualifying race will be set and communicated by 31Dec14 depending on number of competing teams per region to keep a fair participation rate at the EMEA Final (for reference, in 2014, the top 4 teams of each qualification race

Section 7: Timed Race Procedure

1. The agenda of the race is to be issued by Freescale at least 7 days prior of the date of the race. The agenda can be altered on short notice to adapt to special situations that may arise during the racing days.
2. Testing - Prior to final race, a test track will be available. Final calibrations may be made at this time.
3. The racetrack may be altered after testing, prior to the final race.
4. Racing order will be randomly set by the race committee and posted on site
5. A qualifying race may be used to limit the number of teams competing in the final race
6. Before the race begins, all vehicles will be collected and displayed. Teams will not be allowed to modify software or hardware of the vehicle from this point forward.
7. After being called by a referee, each racing team should designate a member to take

their racing vehicle to the playing field and place it in the starting area of the racing track. Other team members must stay outside the racetrack.

8. There shall be only one team member on the track at any given time (excluding testing times)
9. When the final race begins, a referee will direct each team when to enter the playing field in accordance with the racing order.
10. When your team is called you have two (2) minutes to prepare car.
    a. You may:
        i. Change batteries
        ii. Configure parameters via on-board interfaces. (Switches, Knobs, etc.)
        iii. Alter the angle of your camera
    b. You may not:
        i. Reprogram your controller
        ii. Configure parameters via wired or wireless communications.
11. After the referee confirms “Ready”, the vehicle should leave the starting area within 30 seconds.
12. Teams have THREE attempts to complete ONE lap. The FIRST (<u>not the best</u>) completed lap time will be recorded.
    a. Example:
        i. Attempt 1 – Vehicle goes to fast around a curve and goes off track. Time is not recorded.
        ii. Attempt 2 – Vehicle makes it around track successfully. Time is recorded.
        iii. Attempt 3 – Is forfeit because FIRST time (Attempt 2) has been recorded.
13. Upon exiting the racing area, the racecar must be placed back on the inspection area

Section 8: Race Day Schedule

1. Practice Time - Prior to final race, a test track will be available. Final calibration may be made at this time. This will be organized with team slots and/or “free-time”.
2. Reconfigure practice track to final track.
3. Vehicle Inspection
4. Final Racing
5. Awards Ceremony

Section 9: Event Personnel

Organizing committee – A committee of senior judges and Freescale event organizers. Will coordinate event day activities and mediate and resolve any disputes.
Referees - Responsible for on-track activities. This includes race track management such as starting and stopping vehicles, as well as timing and scorekeeping. Comprise up of of faculty, student, and/or Freescale and industry employees.
Judges - Interpret and enforce rule compliance. This will be comprised of Freescale employees and members of contributing industry sponsors.

Event Personnel shall not aid 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.

Section 10: Fouls, Failure and Disqualifications

The rules will be interpreted by Freescale and the organizing committee of the event.

Foul, is a minor infraction, which results in time penalties.
Failure, results in the current attempt time not being recorded. Subsequent attempts are allowed.
Disqualification is a major infraction which results all times not being recorded.

1. Referee will determine whether the racing car ran out of the race track and assign time penalties.
2. Any of the following conditions will be considered a ***foul*** and will result in time penalty added:
    a. The race car fails to leave the starting area within 30 seconds after beginning of the race [+1 second].
    b. The race car fails to stop 2 meters/6 feet after crossing the finish line [+1 second].
3. Any of the following conditions will be considered a ***failure*** and no time will be given:
    a. Three or more wheels leave the race surface.
    b. The racing team fails to enter the playing field and get prepared for the racing in two (2) minutes after being called by the referee.
    c. The player touches the race car after the technical inspection without consent of the referee.
    d. The race car fails to finish within 120 seconds after leaving the starting area.
4. Any of the following conditions will be considered a ***disqualification***:
    a. Any auxiliary lighting equipment or other auxiliary sensors are used around the race track.
    b. Modification of the hardware or software after the race has begun (except for changing the battery.)
    c. More than one team member in the playing field.
    d. Any behavior that might interfere with the movement of the car.
    e. Touching the car during an attempt prior to crossing finish line.
    f. Any cheating during the competition.
    g. Failure to pass the technical inspection.

Section 11: Scoring

1. Equality and fairness will be ensured as much as possible on the condition of actual feasibility. Disputes will be resolved by a vote of Freescale, members of the organizing committee, and judges.
2. Time starts when the racing car crosses the start/finish line.
3. Fouls will result in the time addition to the car's lap time.
4. Disqualifications and Failures will result in no score.
5. Time will be captured using an electronic gate and/or handheld timer.
6. The best overall time, will be named Freescale Cup EMEA Champion

Section 12: Awards and Certificates

Students will receive participation certificates for each race (qualification and finals) in which they

race. If students are not able to race, no certificate will be given.

Racing Trophies will be given to the top three teams during the EMEA Finals.

Section 13: Parameters of the Racing Track

1. A test track made from the same material as the final track will be made available prior to the final race for calibration and design modifications.
2. The actual layout of the final racing track will be unknown to competitors until competition start.
3. Width of the racing track shall not be less than 600mm/23.65in.
4. Material specifications regarding the surface of the racing track will be provided on the web site of the event.
5. Surface of the racing track is matte white, with a continuous black line (25mm/1in wide) on each edge of the track.
6. The racing track can intersect with a crossing angle of 90°.
7. The racing track can have inclines, declines, and tunnels.
8. Start/Finish line is 1000mm/39.4in long in the racing track. In addition, there is a black starting line 100mm/3.9in long at both sides of the starting point. Start time and end time will be determined when the front part of the racing car passes the starting line. The car must be able to automatically stop within three meters of the starting line after finishing the race.

The edge line track information can be found on the Freescale Community at https://community.freescale.com/docs/DOC-1092

The rules and conditions are subject to change by Freescale if necessary. Freescale reserves the right in their sole discretion to cancel, suspend and/or modify The Freescale 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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