Engineering Technical Challenge

ENGINEERING TECHNICAL CHALLENGE

PRESCHOOL / LOWER PRIMARY

General Rules

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Organised by :

SCHOOL OF ROBOTICS

SPRITE
ROBOTICS INNOVATION TECHNOLOGY ENTERPRISE

ETC REGULAR CATEGORY
CHANGE LOG

Version	Date of Change	Description of Change(s)

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1. General Information

The Engineering Technical Challenge(ETC) is a LEGO programming and engineering competition event. It specifically evaluates participants' abilities to independently devise and construct a robot while coding it on the spot. The focus is on evaluating participants' aptitude to build and code within predefined time limits and task parameters, fostering essential skills for problem-solving and innovation.

ETC categories comprises of:

- ETC Preschool
- ETC Lower Primary
- ETC Tertiary Quest
- ETC Tertiary Challenge

2. Theme for ETC

The theme for ETC is **"Disaster Relief" .** Disaster relief refers to the immediate response and early recovery efforts aimed at providing basic needs such as food, water, clothes, and shelter to those most affected by a disaster. Natural disasters such as tsunamis, earthquakes, hurricanes, storms and furthermore put lives in danger, damaging properties, causing living environment and services to be disrupted. Disaster relief is important for the immediate response and rescue of civilians in times of a disaster.

3. Team and Age Groups Definitions

1. A team consists of 2 or 3 students
2. A team is guided by a coach.
3. 1 team member and 1 Coach are not considered a team and cannot participate.
4. A team may only participate in one of the ETC categories.
5. Any student may participate in one team only.
6. The minimum age of a coach is 18 years old.
7. Coaches may work with more than one team.
8. The age groups specified for ETC are :
    - Pre-school: students 5 to 6 years old (in 2025: born years 2019-2021)
    - Lower Primary: students 7-9 years old (in 2025: born years 2016-2018)
    - Tertiary: students above 17 years old (in 2025: born years 2007)
9. The maximum age reflects the age that the participant turns in the calendar year of the competition, not his/her age at the competition day.

4. Game Documents and Rule Hierarchy

1. During a season, ETC may publish additional Question & Answers (Q&As) that can clarify, extend or re-define rules in game and general rule documents. Teams should read these Q&As before the competition.

2. At the competition day, the following rule hierarchy applies:
    - General rule documents build the base for rules in this category.
    - Game documents of the age group clarify the missions on the field and may add special game definitions (e.g. the orientation of the mat or another starting position of the robot).
    - Questions & Answers (Q&As) can overwrite rules in game and general rule documents.
    - The chief judges on the competition day have the final word in any decision made.

5. Robot Material and Regulations

Preschool and Lower Primary:

1. Every team builds one robot to solve the challenges on the field. The maximum robot dimensions before the robots start a run are 250 mm x 250 mm x 250 mm. Cables must be included in these dimensions. After the Robot has started, the dimensions of the robot are not restricted.

2. Teams are allowed to use only the following materials to build the robot :

   For both Pre-School and Lower Primary:

Controller	LEGO® Education SPIKE™ ESSENTIAL; LEGO® LEGO Education WeDo 2.0
Motors	Only motors from the platforms/sets mentioned at “Controller”
Sensors	From the platforms/sets mentioned at “Controller”.
Batteries	Only official LEGO rechargeable batteries (no. 45612 for SPIKETM Essential).
Building Materials	For the construction of the robot only LEGO® branded elements are allowed.

3. It is allowed to cut the size of original LEGO® ropes or tubes. Any other modification on any other original LEGO® or electrical part is not allowed, and it is not allowed to use screws, glues, tapes or any other Non-LEGO® material to fasten any components on robots.

4. A team is allowed to bring and use only one controller during practice time or robot runs. The team can bring spare controllers but the team should leave it with the coach. If the team needs a spare controller, the team should contact the judge before getting the spare part.

5. A team should place the controller in the robot in a way that makes it easy to check the program and stop the robot by a judge.

6. During the attempt, the robot may be moved/operated under programmed control autonomously or under remote control or using a combination of the two methods. The robot can be controlled by any compatible devices other than phones.

7. A team is not allowed to perform any actions or movements to interfere with or assist the robot after the robot started with the run.

8. The number of motors and sensors to be used is not restricted.

9. If a team wants to use any equipment to align in the start area, this equipment must be built out of LEGO® materials, it must fit into maximum robot dimensions (i.e.included in the 250 mm x 250 mm x 250 mm dimensions).

10. Bluetooth and remote connection are allowed. It is not allowed to interfere or obstruct any other team or robot with the remote connections a team uses.

11. A team should prepare and bring all the equipment, enough spare parts, software and one portable computer (or other programming device except for smartphones) it needs during the tournament. Teams are not allowed to share a laptop and/or the program for a robot on the competition day. The competition organiser is not responsible for the maintenance or replacement of any material, not even in case of any accidents or malfunctions.

6. Game Table and Equipment

1. In this category, the robot solves missions on a field. Every field consists of a game table (an even ground with borders) and a printed mat that is put into the game table. Every age group has its own mat because in every age group there are different missions to solve.

2. For Pre-School and Lower Primary, the dimensions of an ETC mat in an age group are 2362 mm x 1143 mm split in two halves in the middle of the longer side of the playfield. Each halves of the mat should have the dimensions of 1179 mm x 1143 mm. Game Tables have the same size or max. +/- 5mm in each dimension. The official height of the borders of a game table is 50mm, higher borders can also be used.

3. The game mat must be printed with a matt finish/overlay (without reflecting colours!). The preferred printing material is poster paper. The material of the game mat should not be too soft (e.g. no mesh banner material).

4. If a game element is placed in the starting area at the beginning of the run, the object has to fit within the 250 mm x 250 mm x 250 mm together with the robot. The object cannot be taken off the mat.

5. If game objects must be fixed on the game field, the organisers decide on the material to fix the objects unless the game rules specify it differently. For example, double sided tape or hook-and-loop tape.

6. It is not allowed to damage game objects. If a game object is damaged, a potential score of the game object does not count (unless the game document states it differently).

7. The start area of the robot is exclusively the white area within a coloured border. The robot must be completely within the start area (white area) when starting.

8. ETC will make every effort to their best abilities to ensure that all fields are correct and identical, but you should always some variability, such as:
    - Flaws on the field
    - Variety in colour brightness on the game mat, from table to table
    - Variety in lighting conditions, from hour to hour, and/or table to table
    - Judges' shadow on the field
    - Judges will walk around the field during judging
    - Texture/bumps under the mat
    - Waviness in the mat itself. Location and severity of waviness varies

7. Awards and Prizes

For Lower Primary:

Award	Rank	Comments	Prize
Best Presentation Award	1st 2nd 3rd	Shortlisted for presentation on competition day.	
Best Robot Performance	1st 2nd 3rd	Participated in Robot Run	
Championship Award	1st 2nd 3rd	The Championship Award assessment is based on the scores of the top finalists according to the following weightage: • 80% Robot Performance • 20% Presentation Score on the preliminary rounds	

For Preschool & Tertiary:

Award	Rank	Comments	Prizes
Best Robot Performance	1st	Participated in Robot Run	
	2nd		
	3rd		

The Organiser reserves the right to amend the prizes without prior notice.

8. Tournament Format and Procedure

8.1 Presentation Format (For Lower Primary)

Presentations will be done in 2 formats:

1. Video recording of 5 minutes.
2. Shortlisted teams will be presenting live to judges on the competition day itself.

The details of the Presentation are as follows:

1. All teams will have to submit a video recording of them showcasing their solution to their problem statement that is chosen.
2. The video in question should be no longer than 5 minutes any submissions that are over this limit will be penalised while grading.
3. The video should be named as their team name. Eg; **Team shark**
4. Shortlisted teams will be informed before the competition date.
5. It is not necessary to have any form of visualisations for the presentation but any done will be graded accordingly.
6. Presentation video should be uploaded on the team's google drive.
7. Only one resubmission is allowed per team, the submitted video should be named as their team name with the number **2**. Eg; **Team shark 2**

Teams are to submit the link to their presentation video, uploaded on to google drive, through a google form.

Submission of videos should be no later than 8 March 2025. Teams who did not submit or missed the due date will be given 0 points for this section.

Teams that are shortlisted will be announced and notified on 22 March 2025.

8.2 Tournament Format (For Preschool, Lower Primary and Tertiary)

The tournament will be held on **29 March 2025.**

Especially for this section, please see the definitions of words in the glossary attached.

1. The tournament in this category must consists of the following elements:
    - A number of practice times (align for local circumstances)
    - A number of robot rounds

The tournament in this category can consist of the following elements :

2. An assembly of robots during the first practice time. In this case, the first practice time should be at least **2 hours** to allow teams to assemble the robot and attachments and

practice on the field.

3. Teams that have been shortlisted for the presentation portion will be presenting on the day itself.

4. An extra-challenge for participants.

5. The assembly of robots, all parts of the robot should be **disassembled** before the start of the assembly period.

   Disassembled definition and scenarios :
   - No robot frames.
   - No joint lego parts, even with plugs, axles.
   - Tire cannot be put on a wheel.
   - Sensors, Motors, wires, lego brick controllers should not be connected.
   - What teams are allowed to do :
     - Teams are allowed to sort all parts strategically, either on the table in front of the team or prepared and sorted in bags. These bags must be transparent and can only be labelled with numbers (no words). Electrical parts can be marked with single keywords (Ultrasonic sensors, medium motors)
     - Teams are allowed to bring the code of the program with its comments. It is not allowed to bring any instructions, guides or further information (paper or digital) into the competition area. Instead, blank paper and pen is allowed to record values and errors. The judges will check the state of all parts before the start of the first practice round. During this time, the team is not allowed to touch any parts of the computer.

6. During the 2 hours assembly period:
   - Teams are required to leave their programming device on the quarantine table before settling down in an area with their parts.
   - Teams are allowed to interact with other teams during this time however they are not allowed to interact with anyone who is not in the quarantine zone except for the judges who will be present.
   - Teams may only start calibrating their robots /on the map provided when they have finished whatever they need to build

7. In the event where the team for whatever reason are unable to finish the building on their own, they are allowed to approach a judge and request for **external help (Photos of their robots, pdf instructions or help from the coaches).**
   Doing this on the day of the competition will void them of the building points. (Refer to Game Rules)

8. Teams work in designated team areas and are only allowed to modify the construction or code of the robot during practice times. If teams want to make test runs, they need to queue with their robots (controller included). No laptops should be brought to the competition table and no own mats should be brought to the team area. Teams need to calibrate their robots during practice time, not directly before an attempt. If there are different tables for practice and official robot attempts, the team may ask the judges to calibrate the sensors on the official game tables.

9. Coaches are not allowed to enter team areas to provide any instructions and guidance during the competition, unless teams ask for it. Specified coaching times, where teams and coaches meet, can be defined. During such coaching times, coaches could bring notes to talk to the team but are not allowed to hand any materials to the team.

10. Before practice time is over, the teams must place their robots on the quarantine table. A robot that is not handed in on time will result in a voided run.

11. Once the practice time is over, the judges prepare the competition tables for the next round (including possible randomization of game robots) and robot check-time starts.

12. Before the robot is placed on the quarantine table, the robot should :
    - Be powered off
    - The robot must not be connected to any external devices when on the table
    - Only having one executable program (sub-programs that belong to one core program are OK) Judges must have the opportunity to clearly identify one program on the robot. Teams have to inform the Judges about their program name during the quarantine. The name of the program will be written down on the robot parking lot at the quarantine table and only that program can be started by the team. If there is no program on the robot, the team cannot join this round and is disqualified for this attempt.

13. During check-time, the judges will inspect the robot and check all regulations (Section 5 of Robot Materials and Regulations. If a violation is found at the inspection, the judge will give the team three minutes to convert the violation. It is not allowed to transfer new programs during these three minutes. If the violation cannot be solved during the time, the team is disqualified for this attempt.

14. It is suggested that every participant receives a participation, bronze, silver and gold certificate based on the robot performance based on the following table (see below). Competition organisers can decide to only do a ranking based on these criteria (without a ranking of placements 1st, 2nd, 3rd) or to award these certificates additional.

15. For Lower Primary category both the robot run (80%) and the presentation (20%) scores will be combined together, after which they will be graded against each other. Teams will be ranked according to their overall performance, for example the team scores who fall

under the 90th percentile and above would get platinum.

16. For the Lower Primary category, along with the certifications, nominated teams will be able to win only **a single award** for all categories. For example: If a gold team is nominated for more than one category, it gets **only *one* award** of the higher ranking and releases all the other awards for other teams, while retaining their gold certification.

For Lower Primary:

Overall ranking in Percentile of student teams present	**Certification**
Below 30th	Bronze
Less than 60th but greater or equal to 30th	Silver
Less than 90th but greater or equal to 60th	Gold
90th and above	Platinum

For Preschool & Tertiary:

Best Robot Run	**Certification**
0 - 30%	Bronze
>30-60%	Silver
>60-90%	Gold
>90%	Platinum

9. Robot Attempt

1. Each robot attempt is **2 minutes.** Time begins when the judge gives the signal to start.

2. The robot must be placed in the starting area so the projection of the robot on the game mat is completely within the start area. The participants are allowed to make physical adjustments to the robot in the starting area. However, it is not allowed to enter data to a program by changing positions or orientation of the robot parts or to make any sensor calibrations of the robot. For example, adjusting an arm of the robot to a specific degree, to input information, is not allowed. Entering data in any way is not allowed. If entering data is suspected, the team will be investigated by the Judges.

3. If the robot loses any parts on the field, these parts are considered free and do not belong to the robot anymore, but stay on the field. It is not allowed to lose the controller, motors or sensors. In that case the attempt will be scored with 0 points and 120 seconds.

4. In the event that starting a program directly sets the robot in motion, the team needs to wait for the start signal of the judge before starting the program.

5. In the event that starting a program does not directly set the robot in motion, participants are allowed to start the program before the start signal. After that, it is allowed to set the robot in motion by pressing the central button on the controller, no other buttons or sensors are allowed to start the robot.

6. If there is any uncertainty during the robot attempt, the judge makes the final decision. The judge should decide in favour of the team if no clear decision is possible.

7. A robot attempt will end if…
    - The robot attempt time (2minutes) has ended.
    - any team member touches the robot or any mission objects on the table during the run.
    - The robot has completely left the game table.
    - the robot or the team violated rules or regulations.
    - a team member shouts “STOP” and the robot does not move anymore. If the robot is still moving, the robot attempt will only end once the robot stops by itself or is stopped by the team or judge.

8. Once the robot attempt has ended, time is stopped and the judge scores the attempt based on the situation on the field at this point of time. The points are awarded based on the randomization at the beginning of the run. The scores are noted on a scoring sheet which the team needs to sign off the scores (on paper signature). Once the score is signed off no further complaint is possible.

9. If a team does not want to sign off after a certain period of time, the judge can decide to disqualify the team for this round. It is not allowed that a team coach joins the discussion with judges on the scoring of the run. Video or photo proofs will not be accepted.

10. Teams should stay in their respective areas (half of the playfield) if either one of the members crosses over up to 2 verbal warnings will be issued any further offence of this nature will cause the team to be disqualified for that run.

11. Teams are only allowed to interact with their robots during the run when the entire robot is in the home base any other times of contact would result in the team being given a verbal warning up to 2 warnings and if the 3rd one is given the team would be disqualified for this round.

12. If a team touches or changes the task objects on the playing field during or after the attempt, the team will be disqualified for this round.

13. A disqualification of a team in a round will result in a robot attempt with zero score.

14. If a team finishes an attempt without having solved a (partial) task that yields positive points, the time of that run will be set at 120 seconds.

15. The ranking of teams depends on the overall tournament format. For example, the best attempt out of three rounds will be used and if competing teams have the same points, the ranking is decided by the record of time the faster robot will be crowned the winner. If time is the same for both teams it will then be decided by the total weight of the robot and its attachment, the lighter will be crowned the winner.

10. Format of an Extra-Challenge

1. The Extra-Challenge is an **add on surprise challenge** that teams can solve in the afternoon of a one-day competition.

2. The missions of this challenge will be orientated on the challenges on the field of the specific age group, so that teams that have prepared themselves for the regular missions will be able to solve the day-challenge as well.

3. The extra-challenge still has multiple practice times and rounds as the regular missions.

4. If a tournament format includes the day-challenge, the day-challenge should have a significant effect on the ranking of the teams (e.g. by combining scores of the regular age group challenges and the day-challenge and/or by awarding teams separately).

Glossary Terms

Check Time	During the check time, the judge will take a look at the robot and check the measurements (e.g. with a cube or a folding rule) and other technical requirements (e.g. only one program, Bluetooth off etc.). A check needs to be done before every official robot attempt, not during practice time.
Coach	A person assisting a team in the process to learn different robotics aspects, teamwork, problem solving, time management, etc. The role of the coach is not to win the competition for the team, but to teach them and guide them through the problem identification and in discovering ways to solve the competition challenge.
Extra-Challenge	The extra challenge is an unknown challenge that teams need to solve on the competition day. The extra challenge should foster the quick thinking and problem-solving skills of the students while allowing them to solve challenges with their robot of the morning / first day.
Practice Time	During the practice time, the team can test the robot on the field and the team can change mechanical aspects or the coding of the robot. In case of an event where teams need to assemble the robot, the teams will do that at the start of the first practice time.
(Robot) Attempt	A robot attempt is the official try to solve the missions on the field. A robot attempt will be scored by judges and is a maximum of 2 minutes long. Teams usually do multiple attempts during practice time to test the robot before the official attempts.
Robot Round	During one robot round, every team will run their robot on the game field. Every round contains a Check-Time before the actual runs start. Before the round starts with the first team but after all robots are placed on the quarantine table, randomizations to game fields (if any) are done.
Quarantine Table	Quarantine table is the place where all teams must place their robot powered off before the practice time is over.
Team	In this document the word team includes the 2-3 participants (students) of a team, not the coach who should only support the team.