The Rules

The following rules are taken from the 2007 FLL Challenge, and have been adapted for use in Comp 2910. These rules take precedent over the FLL rules.

1. **Read this First:** To maximize performance and eliminate surprises, you (the team) must take the time to read and understand FIVE documents: the Field Setup Instructions, the Missions, these Rules, and the FLL Questions & Answers (Q&A) document, and the Comp 2910 Q&A Forum.
2. **Mission:** A mission is a job the robot can perform to achieve results that are worth points. The robot starts from Base and goes out on one or more trips to work on one or more missions per trip. Missions may be tried in any order, alone or in groups, re-tried when possible and allowed, or skipped. Points are given if the required results are still visible on the field ***at the END of the match***.
3. **Match:** In a competition, two Challenge fields are joined back to back, and each team is paired opposite another to compete in a match. For 3 minutes, the robot tries to get as many points as it can by achieving mission results. The timer never pauses during a match. Each team participates in at least three matches in a tournament, and each one is a fresh chance for you to get your best score. No match has anything to do with another, and only your best score counts, with the highest score being declared the winner of the tournament.
4. **Round:** The process of cycling all teams through one match each is called a round. Tournaments run at least three rounds. Between your match in one round and the next, you have time to go to the pit area and work on the robot and its programs as needed, but this time may be limited, depending on the schedule of other proceedings.
5. **Tournament:** A tournament is a series of rounds. All team have exactly the same number of matches in a tournament. The highest score from any round is used to determine the overall winner of the tournament.
6. **Construction Phase:** Teams begin the tournament with nothing constructed (ie: no connected Lego pieces), and no programs loaded in their robots. Teams have thirty (30) minutes to build and program their robots. All robot construction and programming must stop at the end of the Construction Phase.
7. **Competition Phase:** The construction phase is followed by a Competition Phase which consists of at least three 3-minute rounds. Once
8. **Repair and Modification:** Once competition has started and a timer has been started for a team, that team may resume construction and programming of their robot. The team may continue with construction and modification of their robot until the end of their last match. Construction and modification is allowed between rounds.
9. **Disassembly:** Robots must be completely dismantled at the end of the Competition Phase.
10. **Participation:** The only allowable team size is five members, not including instructors and supervisors. During a match only two team members at a time are allowed right up at the competition table except during repair emergencies. The rest of the team may stay nearby, but away from the table. To share in participation, members may rotate in/out at any time.
11. **Robot:** The robot is defined as the RCX or NXT brick and anything currently connected or attached to it. All robots must be autonomous (ie: they must operate on their own without remote control of any sort. Mission models, strategic objects, separate pieces, and separate attachments are not part of the robot.
12. **Materials**: This rule is not just about the robot. This rule controls everything you bring from the pit area to the competition area including the robot, all attachments, and all strategic objects when viewed all at once as a package. All these objects must be made entirely of BCIT Supplied LEGO elements in original factory condition (except LEGO string and tubing may be cut to length), and must conform to the following quantity limits on electrical parts, no matter what you intend to use or connect or attach to the robot at any one time:

For RCX users:	**For NXT users:**
RCX controller (1)	NXT controller (1)
motors (3)	motors (3)
touch sensors (2)	touch sensors (2)
light sensors (2)	light sensors (2)
lamp (1)	lamp (1)
rotation sensors (3)	rotation sensors (3 minus the number of NXT motors present)

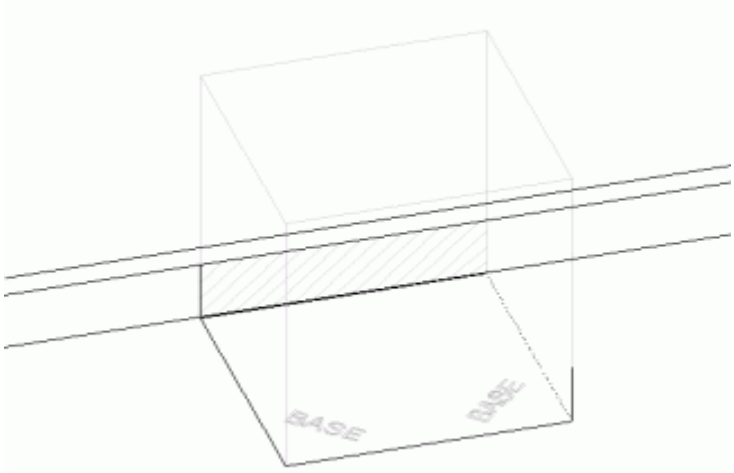
ultrasonic sensor (1)	ultrasonic sensor (1)
compass sensor (1)	compass sensor (1)
3rd touch OR light sensor	

Color sensors, sound sensors, or any other type of sensor not listed above are strictly prohibitted.

LEGO wires and converter cables are allowed as needed. Spare/alternate electrical parts are allowed in the pit area. Objects functioning as remote controls are not allowed anywhere. There are no restrictions on the quantity or source of non-electric LEGO pieces. Wind-up/pull-back "motors" are allowed, and do not count as motors. Pneumatics are allowed. Marker may be used for owner identification in hidden areas only. Paint, tape, glue, oil, etc. are not allowed. Stickers are not allowed.

13. **Software:** The robot must be programmed using either a Java or C-style language (eg: Lejos or NQC). If you wish to use any other language, you must first request permission from the course instructor. The drag-and-drop LEGO software as supplied in LEGO sets may not be used for this competition.
14. **Downloading:** One team's download can erase another team's programs and ruin their performance. Therefore, downloading is only allowed in the pit area. Download settings must be kept on short range, the process must be shielded from surrounding teams, Bluetooth must be switched off, and the robot should be kept OFF when not in use.
15. **Wireless:** Bluetooth and IR transmitting may not be used by a robot during a competition, except in the case of RCX users, who may use IR to download programs in the pit area only (as described in rule 10).
16. **Base:** Base is an imaginary hollow shape formed by vertical walls that rise from the perimeter of the Base's footprint (including the inside surface of the border walls), and by an invisible ceiling 16 in (40 cm) high. NOTE: Base is a VOLUME—not an area. Base is the place for the robot to be prepared, started from, and serviced, and sometimes Base is a target for scoring objects. The robot does not always have to go back to Base for missions to count, and the robot does not have to be in Base when the match ends. Any time a person manually returns a robot to base, even after completion of a mission, is called a rescue. Points are deducted for each rescue (see Scoring document). If a mission requires the robot to return to base for the mission to count, this will be explicitly stated in the mission.

    BASE:



17. **Housekeeping:** Any objects in Base which could get in the way of the robot's preparation or motion may be kept "near" Base as long as they do not cause any changes in the field, and their placement is not strategic in any way.
18. **Operational Definitions:** Though the Challenge is fun, it is robotics after all, and like all technical work it depends on specifics and exact descriptions of physical conditions. To avoid disagreement between you and the adjudicators over the meanings of common words, we provide these operational definitions for the locations/positions of objects (including the robot) with respect to the missions, rules, and Q&A. Be sure to refer back here when you see these words or their opposites:

    IN/INTO/TO (for areas as targets) Any bit of the object just needs to barely cross over the outer edge of the target.

    IN/INTO (for containers as targets) The object must be trapped from being dislodged in at least five directions.

OUT (for areas and containers) Not one bit of the object is in. Note: Out always means completely out.

ON/ONTO (for objects as targets) The target must be able to support all the weight of the object when any/all other supports are removed, as proven or estimated by the ref.

OFF (for areas and objects) None of the object's weight is being supported in any direction.

TOUCHING (for any target) The object itself must be making direct contact with the target, only when the word "touching" is used. COMPLETELY Every bit of the object must meet the condition.

19. **Strategic Objects:** Strategic objects are team-supplied objects other than the robot and its attachments, handled by you during preparation mode, or used by the robot in autonomy mode.

20. **Scoring Objects:** Scoring objects are objects that could be worth points depending on their location. To score, each scoring object must itself meet the mission requirements for points, no matter where the robot or any strategic objects is.

    You are not allowed to bundle, connect, or attach scoring objects to each other, but placing them in a strategic container is allowed.

21. **Stray Objects:** A stray object is any object caused by a robot to be in the way of either team's robot. Stray objects may not be moved by a team member, except as described in the ROBOT DAMAGE rule, or when the object is IN the base. Objects in scoring position may not be shifted. Worthless objects must stay on the table.

22. **Loss of Contact:** If the robot is in autonomy mode and loses contact with any object (eg: it drops something that it is transporting), that object stays where it is and is considered stray, except as described in the ROBOT DAMAGE rule. For loss of contact in transition mode, the team maintains control of the object.

23. **Preparation Mode:** Before the match starts, and before every restart, the robot is considered to be in preparation mode. During this time, the robot must be in Base and you may handle it (by hand) as needed, for such things as repairs, changing attachments, loading or unloading objects, setting mechanisms, pressing buttons, signaling sensors, and aiming. Strategic aiming devices may be used, but the robot is not allowed to make contact with them during starts. Objects apart from the robot may be handled in Base or off the table at any time.

24. **Starting Position:** For all starts, every bit of the robot and any objects in contact with it must be completely in Base, with leniency for "slight" overextensions. The word "slight" is not defined here, so you should stay focused on the word "completely."

25. **Starting Procedure:** To be allowed to start, the robot must be motionless in starting position, and you must not be touching it in any way. You are then allowed to use one of three ways to put the robot into motion: touch a button, signal a sensor, or wait for a running/paused program to resume. You must not handle the robot in any other way throughout the start. Freshly started, the robot is then considered to be in transition mode.

26. **Transition Mode:** A freshly started robot is in transition mode until it's out of Base. In transition mode, the robot is not allowed to do anything but leave Base, taking along any objects it was already in contact with. It is not allowed to lose or gain contact with anything at all until it is in autonomy mode (out of Base). Touching the robot in transition mode forces it into preparation mode, and you maintain control of any objects involved.

27. **Autonomy Mode:** As soon as the robot is out of Base, it is considered to be in autonomy mode, free to perform allowable action until the match ends, or until the instant you next touch the robot (or influence it in any way). Touching the robot in autonomy mode (called a "rescue" no matter what the real reason is) forces it into preparation mode. Any objects involved will be left in their rescue spot, and THE REF COULD TAKE OTHER OBJECTS AWAY BASED ON DETAILS IN THE MISSIONS. Each rescue results in a points deduction.

28. **Muscle Action:** You are not allowed to cause anything but the robot to leave or extend out of Base except as described in the STARTING PROCEDURE rule.

29. **Allowable Action:** In addition to actions specifically allowed, any action not specifically prohibited in the Missions, Rules, or Q&A is allowed except those described in the REVERSIBLE ACTION rule. So before you ask any question that begins "Can we...," remember that if nothing written anywhere says you can't, then you CAN. There are no hidden restrictions. In the same way, before you ask any question that begins "Do we have to…," remember that if nothing written anywhere says you have to, then you don't have to. There are no hidden requirements.

30. **Required Methods:** Usually no specific method is required for achieving mission results, and you are free/encouraged to be creative, but when a specific method is required for achieving a mission result, you are not allowed to achieve that result any other way.

31. **Reversible Action:** If something happens that's not allowed, the ref reverses (undoes) it so it has no impact on scoring and reminds you it's not allowed. Note: The robot is allowed to make mistakes, mess up the field, etc.. These actions are not typically reversed.
32. **Robot Damage:** At any time during a match, you may recover robot parts that come off as result of obviously unintentional damage. You may do this by hand or request help from the ref. Retrieval of robot parts that are partially attached to the robot is considered a rescue.
33. **Field Damage:** You are not allowed to take models apart nor add pieces to them. You are not allowed to handle mission models out of Base. You must use the mission models supplied by the tournament and are not allowed to bring duplicates to the competition area. The robot is not allowed to break mission models nor defeat Dual Lock. If a mission model breaks, malfunctions, moves, or is activated by anything other than allowable action, the ref reverses the change as soon as possible (if possible). Field damage, too severe to reverse, is left as is. If points are earned along with field damage that occurs due to faulty model design, construction, or setup as judged by the ref, you keep those points. Field damage that obviously occurs due to the team or robot, whether intentional or not, draws a warning and repeats could make associated missions worthless.
34. **Interference:** Your robot is not allowed to have any effect on the other team's robot, field, or strategy except by directly meeting the scoring requirements of missions in areas that are shared between the two sides by design of the Challenge.
35. **Score Determination:** To minimize controversy about what happened during a Match, THE SCORE IS DETERMINED AT THE END OF THE MATCH, BY THE CONDITION OF THE FIELD AT THAT TIME ONLY. This means that points are not given for accomplishments that the robot accidentally trashes before the match ends.
36. **Benefit of the Doubt:** In situations that are too close to call, like when a split-second or the thickness of a line is a factor, or when a situation could "go either way" due to confusing, conflicting, or missing information, you get the benefit of the doubt. If you disagree with the ref and can respectfully raise sufficient doubt in the ref's mind, the ref may overturn their own initial ruling. This rule is not an order for the refs to ignore requirements, but it is a license for them to make calls in your favor whenever it's reasonable to do so.
37. **After the Match:** At the end of each match, the ref needs time to concentrate and record the condition of the field, so no one is allowed to touch anything. You and the ref look at the field together and come to agreement about what points were scored or missed and why. Finally, the ref gives the okay for field reset.
38. **Variability:** Every effort is made by our suppliers, donors, and volunteers to ensure that all fields are correct and identical, but some variability is to be expected, such as texture/bumps under the mat, waviness in the mat itself, flaws in the border walls, and variety in lighting conditions and rigging. Although the robot is allowed to extend over the tops of the border walls in autonomy mode, interference may vary at the ends of the field.