IEEE SOUTHEASTCON 2024

DRAFT - STUDENT HARDWARE COMPETITION RULES

Version *5.2*

04/16/2023

Note: This is a draft of the official competition rules for SoutheastCon 2024. As the organizing team refines the competion to improve fairness and playability of the game, this document will change to reflect that. Official rules will be posted **ONLY** on the conference website (https://ieeesoutheastcon.org) under the Student Competition tab.

Final rules will be posted by August 4, 2023.

KEY TERMS

Board components – items that are part of the competition

Packages – Square boxes with imprinted logo as delivery packages

Thruster Fuel Tanks – fuel tanks for thruster assembly

Crater – opening between the thruster fuel tank pick up zone and drop off requiring ground robots to use zip line or other unique approaches

Zip Line – wire suspended above the crater

Board Zones – competition field zone for acquiring points

Launch Pad / Thruster Fuel Assembly Zone – competition ending zone

Delivery Zone – Package delivery zone after passing the main ramp

Launch Button / Stop Timer – competition complete end times button

Doomsday Timer – 3-minute max time to complete the competition

Start Green Led Light – light indicating the start of the competition run

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1 INTRODUCTION

The year is 2047. Humanity has established a planetary defense system called GRID to protect Earth from potential threats in space. The system is highly advanced and has thwarted numerous dangers over the years. However, a catastrophic event has occurred, shattering the calm.

A comet named 2047-5-L1 has collided with the V-X7 exploration craft, causing a massive release of asteroids. The asteroids are headed straight for Earth, and the consequences of an impact would be catastrophic. GRID is the only hope of salvation for the planet, but it needs crucial components to activate its active protection systems.

With no time to waste, GRID dispatches your team, comprised of the most skilled and experienced members, to acquire the vital component from a remote location, a perilous task. Your team must brave a treacherous path of obstacles and dangers to deliver the thrusters to the Kennesaw State University launch pad.

As you embark on this journey, you may encounter numerous challenges, including hostile and treacherous terrain and unpredictable weather conditions causing craters to open. However, you must press on, knowing that the planet's fate rests on your success.

Their journey is long and arduous, and there are times when you may think you will fail. However, you must persevere, drawing on your team's strength, courage, and determination. First, your team must deliver the packages to the control station. Afterward, your team must pick up the rocket thruster fuel tanks and bring them to the Kennesaw State Launch Pad.

Only with the system activated is it possible to deflect the asteroids away from Earth, saving the planet from complete destruction. To accomplish to goal, you must deliver the packages to the correct location, pick up the thruster tanks and deliver them to the launch pad as quickly as possible. Earth will hail you as heroes and forever remember your bravery and sacrifice. With your help, humanity knows they can always count on GRID to protect them from any danger lurking in space.

1.1 OBJECTIVE

For each run the robot will have 3 minutes to complete the tasks below. There is no requirement for the order of completing tasks 2 and 3.

1. **Start run**

   The robot will start in the designated Robot Assembly Pad. There, a countdown timer representing a communication message being received by the robot will start counting backwards towards zero. When the countdown timer reaches zero, the run can start, and the robot is free to move. Also, once the countdown timer reaches 0, a doomsday timer will begin counting to 3 minutes.

2. **Acquire and deliver packages**

   The robot needs to collect and deliver as many packages as possible. Packages are located in the Package Pickup Zone and need to be moved in the Package Delivery Zone. For this task, your robot can carry as many packages as possible. The correct arrangement and sorting of the packages will determine the scoring.

3. **Acquire and deliver thruster fuel tanks**

   The robot will need to pick up and deliver the thruster fuel tanks. The thrusters are located in the Thruster Fuel Tank Pickup Zone and need to be moved to the Thruster Fuel Tank Delivery Zone. Once the thrusters are in the delivery zone, the robot must assemble them. In conducing this task, the robot will have to get across a "crater". A zip line is provided for the robot to jump the crater and complete this task. Robots can also choose to "walk" the crater.

4. **Stop the doomsday clock**

To stop the doomsday clock and mark the end of the round, the robot must push the launch button.

1.2 ROBOT SPECIFICATIONS

1. During the competition, robots are required to operate autonomously without any external control or tethering. Communication between different robotic units operating on the competition field is allowed. Any team found in violation of this rule will be immediately **disqualified** from the competition.
2. The maximum starting size of the robot will be restricted to 1 ft × 1 ft × 1 ft (*i.e.,* a 1-foot or 12-inch cube).
3. The assembled robot weight must not exceed 25 lbs.
4. The robot may extend arms or appendages (or flags or figures) to complete the challenges throughout the course. A robot **with** appendages must fold/constrict and otherwise fit within the 1 ft cube robot size restriction before a run begins. It may extend past the size restriction after a run begins.
5. It is strongly recommended that robots include an emergency stop (i.e., a button, switch, mechanism, easily accessible power line, etc.). In the event of damage or malfunction, gameplay must be halted.
6. No explosive, pyrotechnic, toxic, or corrosive materials. Flammable liquids or gases are prohibited.
7. While it is the team's responsibility to handle accidental interference, any intentional interference by another robot or team will not be tolerated and can result in immediate **disqualification** from the competition.
8. Teams are responsible for the safety of their robot. Teams should take extra precautions to avoid the robot leaving the game board as no modifications including padding will be allowed to or around the game board and floor. In case of leaving the game board, the team will automatically end the competition set and scoring will be up to that point.
9. The robot shall not present any danger to the judges, spectators, playing arena, or area surrounding the arena. If at any time the judges deem the robot is causing or is likely to cause harm, the judge may terminate the match immediately. The judge will have the discretion of whether any points are awarded for that match and if the robot is allowed to compete in any remaining rounds. Especially noteworthy are any machines that throw -- they must not throw objects long distances or high speeds.
10. There is no limitation on the hardware development, embedded systems utilized, sensors, or assembly. Teams are encouraged to develop as advanced robots as possible to complete the tasks.
11. Advanced embedded systems for use with machine learning models are permissible.
12. Robots must have a clearly labeled start switch.
13. You may choose to use Sonar and LIDAR sensors. However, be advised teams are required to handle any accidental interference from other robots or other noise sources. For example, many cameras have infrared rangefinders, and may accidentally interfere with infrared sensors.
14. We **encourage** robots to be decorated to the conference theme and display a school logo or mascot, school flag, state flag, etc. Mascots and figures are also encouraged, as are robots that play music and have a light show. Any flag or figure must fit within the initial size constraints of the robot. It may extend past the size restriction after a run begins.

1.3   MULTI-ROBOT USE AND COLLABORATION

Multiple robot use is allowed in this competition, subject to the following guidelines:

1) **Robot Assembly**: The robots may disassemble into as many units as possible, but they must begin assembled together in a 12-inch cube. All robots must be assembled together at the start of the competition.
2) **Flying Units**: Flying units or UAVs are **NOT ALLOWED** in the competition.
3) **Unique Designs**: Teams are encouraged to think creatively and build unique robot designs that suit their strategy for the competition. Teams may build a bridge to cross the zipline, but the bridge design must adhere to safety guidelines and not pose a risk of injury to participants, spectators, or property.

By following these guidelines, teams can explore innovative designs and use multiple robots to enhance their chances of success in the competition while ensuring safety for all participants.

2   BOARD DESIGN

The complete design dimensions and assemblies will be in the appendix. The following sections provides an overview of the design and rendered images.
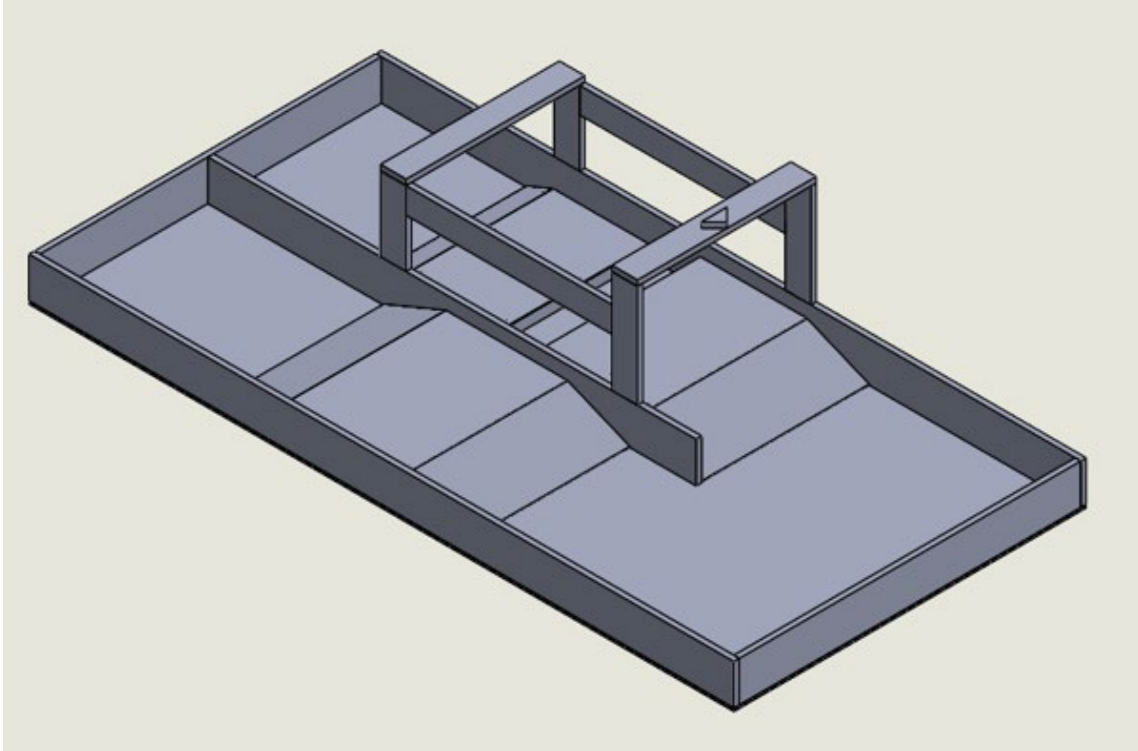

Figure 1: Initial competition design with zip lining.

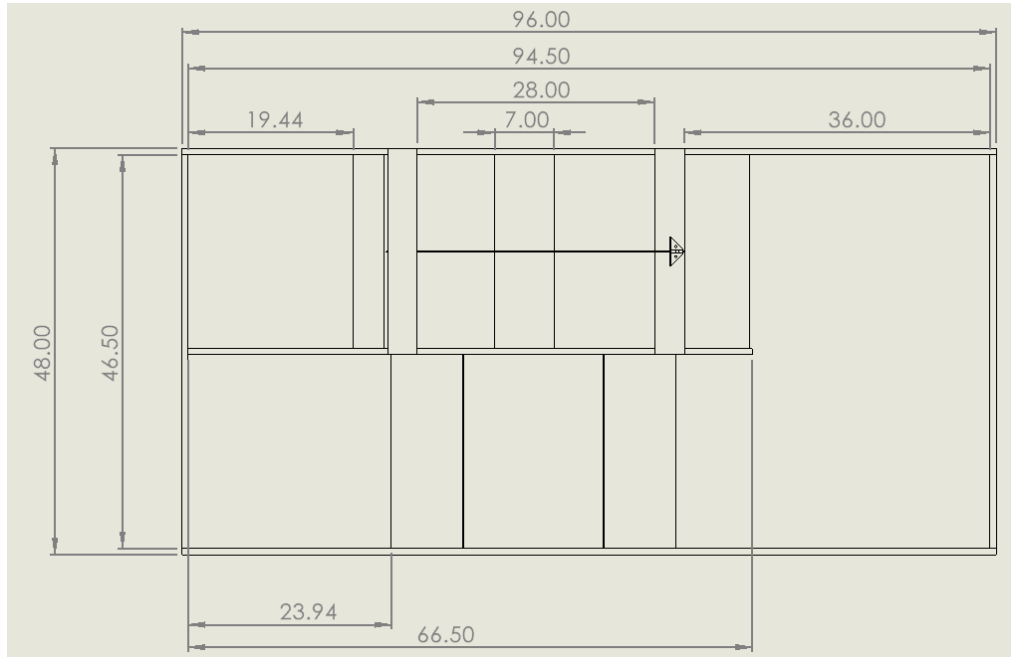Figure 2: Initial competition physical design.

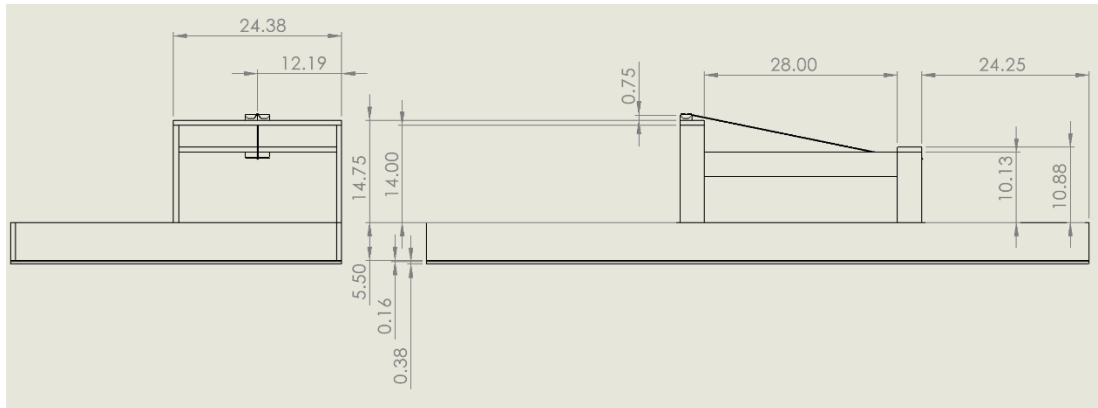Figure 3: Top side dimensions of the competition board in inches.

Figure 4: Sideview dimensions for the competition board in inches.

2.1 BOARD CONSTRUCTION – PLEASE CHECK APPENDIX FOR DIMENSIONS

The construction of the competition layout consists of common materials found at hardware stores and 3D printed materials. Bill of material includes the list of items, quantity necessary, and links.

NOTE: Actual RELIABILT hardware sizing varies based on manufacturer size. All measurements 2 inches or greater will be .5 inches less and all measurements under 1 inch will be .25 inches less. For example, the 1 in × 6 in × 8 ft actual size is .75 in × 5.5 in x 8 ft.

    a.   The competition field exterior size is 4 ft × 8 ft rectangle using a 3/8-inch-thick plywood.

    b.   The border will utilize RELIABILT 1 in × 4 in × 8 ft Square Edge Unfinished Whitewood Board boards assembled with hardware (Hillman #7 x 1-1/2 in Black Phosphate Cabinet Screws Interior Cabinet Mounting Screws) and placed on the inside of the 4 × 8 perimeter.

        Note: The measurements below do not include the top 4 mm layer that is laid on top of the ramp and landing. Thus, **actual height measurements will be +0.157 inches**. For example, a height of 3.5 in with the top layer will be ~3.66 in.

c. The ramp height will be 3.5 inches and the ramp angle will be 22.5°, as shown in the ramp designs located in the appendix.

d. The ramp top landing will be 16.5 inches.

e. The ramp base length on one side is ~8.45 inches.

f. The zipline ramp base is ~8.45 inches long, the height is 3.5 inches.

g. The zip line top landing is 14.5 inches.

h. The zip line arrival landing is 13 inches, the ramp height is 1.5 inches, and the ramp base is 3.62 inches.

i. The zip line thickness is 3/32 inches (National Hardware 8.5 in Zinc Gate Hardware Kit)

j. The final area for thruster tank assembly is ~18.6 in × 22.875 in.

k. The rest of the part sizing and design are provided in the appendix.

l. Color utilized in the field is provided in the appendix.

m. The joist holding the zipline will comprise of RELIABILT 1 in × 2 in × 6 ft Square Edge Unfinished Whitewood Board and the frame will comprise of RELIABILT 1 in × 4 in × 8 ft Square Edge Unfinished Whitewood Board.

n. The field separator between the initial ramp and zipline area uses a RELIABILT 1 in × 6 in × 8 ft Square Edge Unfinished Whitewood Board of 65.5 inches in length (actual size is 0.75 in × 5.55 in × 65.5 in).

Zip Line Holder Dimensions:

o. The top zip line side beam(s) are 0.75 in × 3.5 in × 14 in. The side beams are flush mounted on top of the boarder.

p. The arrival zip line side beam(s) are 0.75 in × 3.5 in × 10.125 in.

q. The zip line cross beam is 0.75 in × 3.5 in × 24.375 in.

r. The zip line support beam between the top and bottom sections is 0.75 in × 3.5in × 28 in.

s. The zip line hardware mounting section consists of a 90˚ isosceles triangle with 3.5 in sides lengths.

t. The zip line hardware mounts on top at the top landing and on the bottom at the arrival landing as shown in the figure below.

Students can send a photo of the board they built to the SoutheastCon 2024 Student Competition Committee if they would like confirmation of their understanding of the design.

2.2   BOARD ZONES
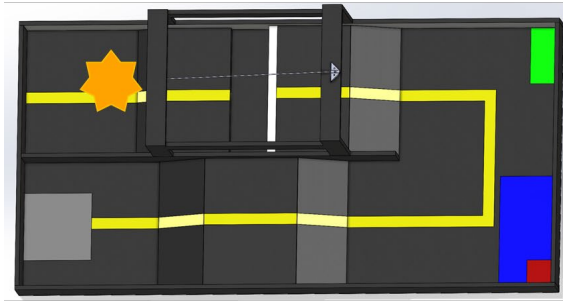
- **Gray** = Robot Start Location
- **Blue** = Package Drop Off Location
- **Red** = Red Package Drop Off Location
- **Green** = Thruster Pick Up Location
- **White** = Indicator To Grab Zip Line
- **Orange** = Launch Pad

- Requires Thruster Fuel Tank Assembly
- Run Completion

Figure 3: Diagram of game board with marked zones.

Robot Assembly Pad
- The starting location for robots for each run.
- The size of the assembly pad is the maximum size of the robot; 12 inches per side

Package Pickup Zone
- All packages will be located in the Package Pickup Zone.
- The size of the package pickup area is ~24 in × 22.875 in.
- The Package Pickup Zone will have several large packages aligned for transport and smaller red packages placed randomly.

Package Delivery Zone
- The size of the package placement and thruster delivery area is ~11 in × 20 in.
- The package drop-off area is large enough to encompass all packages. However, the drop-off area will be marked with different colors corresponding to different packages. Additional points are given for the proper arrangement and sorting of packages.
- Only packages in the package delivery zone at the end of the round will be given points.

Thruster Fuel Tank Pickup Zone
- The size of the thruster fuel tank pickup area is 11 in × 20 in.

Thruster Fuel Tank Delivery Zone
- The size of the thruster fuel tanks delivery area is 18 in × 22.875 in
- Three thrusters in total must be assembled upright in one of the three launch thrusters' locations. The appendix contains the thruster assembly package designs and development.

2.3 BOARD COMPONENTS

All components will be placed on the field prior to the run.

Packages

- There will be a total of 8 packages: 5 large and 3 small.
- All packages will start in the Package Pickup Zone.
- The placement of the large packages will not change while the placement of the small packages will be randomized across runs in the Package Pickup Zone.
- The large packages will be 1.5 inches-square and the small packages will be 1 inch-square.
- The small packages will be red-colored while the large packages color will be randomized and non-red color.

Thruster fuel tanks

- There will be 3 thruster fuel tanks of the same size.
- The placement of the thruster fuel tanks is constant, and it is located next to the launch button that stops the doomsday timer.

Start green led light

- A large green LED will indicate the start of a run. Once the green LED will turns on, robots can begin their run.

Doomsday timer

- The timer will start counting up in millisecond resolution once the run has started.

Launch / Stop Button

- The robot will use this timer to indicate completion of the run.
- The stop button is a 4 x 4-inch button colored red.

3 RULES OF PLAY

3.1 ROUNDS

The competition will have 3 rounds (qualifying, semi-final, and finals). A lineup of time slots and team call orders will be provided and posted to the SoutheastCon website prior to the competition date. For qualifying and semi-final rounds, two boards will conduct runs simultaneously in 5-minute intervals. The final round will be held on Saturday night during the awards banquet on a single board.

Qualifying	
Participants	All teams entered into SoutheastCon hardware competition.
Number of runs per team	Two

Scoring	Each team's final score for qualifying round will be the cumulative of their two runs.
Semi - Final	
Participants	Top 20 teams from the qualifying rounds
Number of runs per team	One
Scoring	Each team's final score for semi-final will be based only on the semi-final run.
Finals	
Participants	Top 4 teams from the semi-final rounds
Number of runs per team	One
Scoring	Each team's final score for final round will be based only on the final run.

3.2   SEQUESTERED AREA

At the start of each round of matches, the judges will require that all robots be sequestered in a special staging area. Once in the staging area, the robots must remain turned off and cannot be touched by students until they are called for their match to begin. The robots cannot be charged during the sequestration period.

3.3   PRE-STAGING

For each match, the judges will call the names of the teams to run in that match. Once called, teams will have two minutes to retrieve their robot from the sequestration area and move it to a pre-match staging area near the arenas. In this area, teams can perform final checks to the robot, make any last-minute adjustments, swap in a new set of batteries, and power it on. Other teams will concurrently compete during this time. Once the current teams complete their matches and cleanup, the judge will call the teams from the pre-match staging area to the arena to begin their setup

3.4   SETTING UP FOR A MATCH

Once teams have been called from the pre-match staging area to the arena, they will have an additional two minutes to get their robots and their arena ready for the match. There is no limit on the number of students allowed in the arena area during setup as long as they can do so without disturbing other nearby arenas.

3.5   CONDUCTING THE MATCH

Once the team is ready, all team members but the one designated to activate the robot must step away from the arena. Then, the team member in charge will indicate to the judge the readiness status of the robot and he or she will back away from the arena to join the rest of his team. At this point, the judge begins the match countdown. No mechanical buttons, physical start systems, or communication starting is allowed. Any interaction with the robot (i.e., remote control, additional buttons, touching or adjusting of the robot, etc.) during this time will lead to disqualification.

3.6   OPEN TEAMS

Open Teams are teams that are not part of the official student branch teams and do not participate in the competition against the official student branch teams.

4   CALCULATING SCORES

1) The fastest time of each run will be **30 points**.
   a) **5 points** will be deducted from each following team.
   b) In the rare case of a tie, both teams will be awarded the same points.
2) There would be an additional 5 points if the robot starts autonomously by recognizing the countdown timer green light
   a) Teams can choose to start their robot manually by pushing a start button /switch. In this case, there won't be any extra points.
3) The package assembly score is as follows:
   a) Each package assembled in the correct zone will be **2 points** for packages in the right zone.
   b) An additional **1 point** for package sorting.
   c) An additional **2 points** for small packages.
   d) Total possible points **30 points**
   e) **5** Larger Boxes * 3 = 15 Max points
   f) **3** Small Boxes * 5 = 15 Max Points
4) The successful arrival at the thruster fuel assembly zone is **20 points**
5) Successful thruster fuel tank assembly is **20 points**
6) **10 point** bonus for Team promotion when in the thruster assembly zone. All teams are encouraged to display their logos, sponsors, and/or university. The display must be shown before pushing the launch button but after thruster assembly.
   a) A static promotion on the robot does not count for the 10% bonus.
7) Maximum Available Points **115 points**
8) The qualification round consists of two runs. The points will be added together, and the teams will be scored based on the total points accumulated.
     The semi-final and final run will consist of a single run and the total score will be based on the single run.

For example, the robot that completes the competition the fastest can receive 30 points for successful completion, 5 points for starting autonomously using the green light, 15 points for delivering 5 larger boxes and properly arranging them, 15 points for delivering 3 smaller packages and arranging them, 20 points for successful arrival at the thruster fuel assembly zone, 20 points for successful thruster assembly, and 10 points for team promotions for a total of 115 points.

4.1   PENALTIES

Game disruption penalties are possible and will result in a penalty against the team. For example, the removal of game objects or intentional destruction that leads to delayed preparation for the next run will result in a penalty of 5 points. This penalty will double with each occurrence

4.2   TIEBREAKERS

In the event of a tie, the team with the fastest (lowest) total time will advance.

5 LOGISTICS

5.1 GENERAL SAFETY

To ensure the safety of all participants and spectators in the robot competition, the following safety guidelines must be strictly observed:

1) The robot must not pose any danger to the judges, spectators, the playing arena, or the surrounding area.

2) In the event that the judges determine that the robot is causing or is likely to cause harm, the match will be terminated immediately.

3) The judge retains the discretion to determine whether any points should be awarded for the match and whether the robot is allowed to continue participating in any remaining matches.

Adherence to these safety guidelines is of paramount importance to ensure the safety of all involved in the robot competition.

5.2 TEAM CHECK IN

Please be ready to provide the following information during the check-in period before the competitions begin:

Team Name: Each team will need to provide the name of their team as it is registered for the competition.

1) **Team Members**: A list of all team members who will be present at the competition should be provided, including their full name and contact information.

2) **Robot Description**: Teams will need to provide a brief description of their robot, including its dimensions, weight, and any special features or functions.

3) **Robot Safety**: Teams are required to provide documentation that attests their robot meets all applicable safety standards and guidelines.

4) **Technical Inspection**: Teams may need to complete a technical inspection to ensure that their robot meets all technical requirements and is eligible to participate in the competition.

5) **Consent and Release Forms**: Each team member and/or their legal guardian may be required to sign a consent and release form, which typically includes information about the risks associated with participating in the competition and releases the organizers of any liability.

It is important to carefully review the competition rules and requirements to ensure that all necessary information is provided during team check-in.

5.3 HARDWARE ROOM

Please follow the following guidelines for using the hardware room:

1) **Access Restrictions**: Only team members and authorized personnel should be allowed to access to the hardware room. All team members must wear appropriate safety gear when using the equipment.

2) **Supervision**: The hardware room should be supervised at all times to prevent unauthorized access and ensure safety.

3) **Inventory Control**: The hardware room should be inventoried regularly to ensure that all equipment is accounted for and in proper working condition. Any missing or damaged equipment should be reported to the event organizers.

4) **Tool Use**: Teams should only use tools and equipment for their intended purpose and in a safe manner. Any misuse of tools or equipment may result in disqualification from the competition.

5) **Return Equipment**: All tools, equipment, and spare parts should be returned to their proper location after use. Leaving tools or equipment lying around may cause safety hazards.

6) **Respect Other Teams**: Teams should respect other teams' use of the hardware room and avoid interfering with their access to tools and equipment.

By following these guidelines, teams can ensure that the hardware room is a safe and fair environment for all participants in the robot competition.

5.4 PRACTICE BOARDS

Please follow the following guidelines for using the practice boards

1) **Will Schedule Practice Time**: Coordinate with the event organizers to schedule practice time on the designated practice field. Follow any rules and regulations established by the event organizers regarding the use of the practice field.

2) **Respect Other Teams**: When using the practice field, respect other teams and their robots. Do not damage or interfere with other teams' robots or equipment.

3) **Follow Safety Guidelines**: Follow all safety guidelines when using the practice field. Wear appropriate safety gear and follow all posted safety instructions.

4) **Be Prepared**: Ensure that your team is prepared for practice. Bring all necessary equipment, tools, and spare parts.

5) **Test Different Strategies**: Use the practice field to test different strategies and refine your robot's performance. Take note of any issues or improvements that need to be made before the competition.

6) **Leave the Field Clean**: Clean up after your team and ensure that the practice field is left in the same condition as it was found.

By following these guidelines, your team can make the most of their practice time and ensure that everyone has a safe and productive experience on the practice field.

5.5 GENERAL COMPETITION RULES

Discord will be used for responses to questions and clarifications to participants. A Discord for the 2024 competition will be available just after the end of this year SoutheastCon conference. Official Student Hardware Competition rules will be posted **ONLY** on the conference website (https://ieeesoutheastcon.org) under the Student Competition tab.

Final rules will be posted by August 4, 2023.

1) **Respect**: Participants must treat each other, organizers, judges, and all equipment with respect. Disrespectful behavior may result in disqualification from the competition.

2) **Fair Play**: Participants must compete in the spirit of fair play, honesty, and sportsmanship. Cheating, stealing, or sabotaging other teams' robots or equipment is strictly prohibited.

3) **No Flash Photography or Light Shining**: Flash photography or shining lights directly at the playing field during a match can distract or blind competitors and is not allowed.

4) **Field Assembly**: Teams are responsible for reassembling the field after their robot competes to prepare it for the next group. Failure to do so may result in disqualification or penalties.

5) **Timeliness**: Participants must be punctual and adhere to the event schedule. Late arrivals may result in disqualification or loss of points.

6) **Robot Inspection**: All robots must pass a technical inspection before competing. The inspection will ensure that the robot meets all specifications and safety requirements.

7) **Robot Size and Weight**: The robot must fit within the specified size and weight restrictions. Failure to comply may result in disqualification or penalties.

8) **Robot Behavior**: The robot must behave in a safe and controlled manner during competition. Unintended damage caused by the robot may result in disqualification or penalties.

9) **Code of Conduct**: All participants, including team members, coaches, and spectators, must follow the event's code of conduct. Any violation of the code of conduct may result in expulsion from the event.

10) **Judge Decisions**: Due to time constraints, the judges' decision will be final and there will be no opportunity for ruling debate

These rules are not exhaustive, and it is essential to carefully review the competition rules and guidelines to ensure full compliance.

6 BILL OF MATERIALS

The items for the competition are purchased form popular retailers, Lowes and Home Depot. If you are purchasing the items from another location, please ensure hardware sizes match. Wood items are labeled as 4in, but actual size is 3.5in.

Quantity	Item	Price	Total	Link
1	RELIABILT 1-in x 2-in x 6-ft Square Edge Unfinished Whitewood Board	$3.49	$3.49	https://www.lowes.com/pd/Top-Choice-Common-1-in-x-2-in-x-6-ft-Actual-0-75-in-x-1-5-in-x-6-ft-Spruce-Pine-Fir-Board/1001066898
6	RELIABILT 1-in x 4-in x 8-ft Square Edge Unfinished Whitewood Board	$8.73	$52.38	https://www.lowes.com/pd/Top-Choice-Common-1-in-x-4-in-x-8-ft-Actual-0-75-in-x-3-5-in-x-8-ft-Pine-Board/1000555115
3	RELIABILT 1-in x 4-in x 6-ft Square Edge Unfinished Whitewood Board	$6.98	$20.94	https://www.lowes.com/pd/Top-Choice-Common-1-in-x-4-in-x-6-ft-Actual-0-75-in-x-3-5-in-x-6-ft-Spruce-Pine-Fir-Board/1000930686
5	RELIABILT 1-in x 6-in x 8-ft Square Edge Unfinished Whitewood Board	$13.21	$66.05	https://www.lowes.com/pd/Top-Choice-1-6-8-2-TCWHITEWOOD-BOARD/1001067086
1	3/8-in x 4-ft x 8-ft Rated Pine Plywood Sheathing	$22.83	$22.83	https://www.lowes.com/pd/Plytanium-3-8-CAT-PS1-09-Square-Structural-Plywood-Pine-Application-as-4-x-8/1000068943
2	RevolutionPly 5Mm x 4-ft x 8-ft Poplar Sanded Plywood	$21.98	$43.96	https://www.lowes.com/pd/RevolutionPly-5mm-Poplar-Plywood-Application-as-4-x-8/50121135
1	Arrow 1/2-in Leg x 3/8-in Medium Crown 18-Gauge Heavy-Duty Staples (5000-Per Box)	$12.98	$12.98	https://www.lowes.com/pd/Arrow-1-2-in-Leg-x-3-8-in-Medium-Crown-18-Gauge-Heavy-Duty-Staples-5000-Count/1000097996
2	Hillman #7 x 1-1/2-in Black Phosphate Cabinet Screws Interior Cabinet Mounting Screws (100-Per Box)	$5.98	$11.96	https://www.lowes.com/pd/Hillman-7-x-1-1-2-in-Black-Phosphate-Flat-Interior-Cabinet-Mounting-Screws-100-Count/3037662
1	#8 Zinc-Plated Steel Screw Eye (50-Piece per Pack)	$12.98	$12.98	https://www.homedepot.com/p/Everbilt-8-Zinc-Plated-Steel-Screw-Eye-50-Piece-per-Pack-803682/204273860
1	National Hardware 8.5-in Zinc Gate Hardware Kit	$15.83	$15.83	https://www.homedepot.com/p/Everbilt-Anti-Sag-Gate-Kit-15469/202042235
1	16-Piece Oscillating Multi-Tool Blade Accessory Set	$49.97	$49.97	RYOBI 16-Piece Oscillating Multi-Tool Blade Accessory Set A241601 - The Home Depot
1	10 oz. Drip Free Smooth Rod Caulk Gun	$4.28	$4.28	Anvil 10 oz. Drip Free Smooth Rod Caulk Gun HD-109T1 - The Home Depot
1	Universal Sanding and Surface Removal Hook and Loop Oscillating Multi-Tool Blade Backer Pad (1-Piece)	$13.97	$13.97	https://www.homedepot.com/p/Dremel-Universal-Sanding-and-Surface-Removal-Hook-and-Loop-Oscillating-Multi-Tool-Blade-Backer-Pad-1-Piece-MM14U/300232821
1	3 in. x 1/4 in. Tiny Trim Shed Resistant White Woven Mini Paint Roller Kit	$3.48	$3.48	https://www.homedepot.com/p/3-in-x-1-4-in-Tiny-Trim-Shed-Resistant-White-Woven-Mini-Paint-Roller-Kit-HD-MS-4/205871764
1	6 in. x 3/8 in. Microfiber Mini Paint Roller (2-Pack)	$6.37	$6.37	https://www.homedepot.com/p/6-in-x-3-8-in-Microfiber-Mini-Paint-Roller-2-Pack-HD-MR-701-2-6/202097482
1	Best 3 in. Tiny Trim Kit Woven Refill 2-Pack	$3.48	$3.48	https://www.homedepot.com/p/Best-3-in-Tiny-Trim-Kit-Woven-Refill-2-Pack-HD-MR-4-0300/205871765
1	1 qt. Base 1 Flat Interior Paint	$10.98	$10.98	https://www.homedepot.com/p/Glidden-Premium-1-qt-Base-1-Flat-Interior-Paint-GLN9011N-04/206755818