



# INTERNAL COMPETITION

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C A P T U R E   T H E   F L A G

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Rulebook

Saturday, November 9th  
11-7PM | Bauman Center



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## I

## OVERVIEW

Capture the Flag (CTF) is a widely-recognized game that has been played for centuries all around the world and will be the inspiration for our 2024 Internal Competition. The main goal of the game is to capture the opposing alliance flags and bring them back to your own base while protecting your own flags from being captured. The game will be a 3 versus 3 tournament with an upper bracket and a lower bracket.

## 2

## ELIGIBILITY

**All participants must...**

- Be enrolled as an undergraduate or graduate student at Stony Brook University
- Have lab safety training completed and documented by an e-board member
- Register individually or as a team before attending workshops, build sessions, and the competition

## 3

## SAFETY

- Participants are required to follow lab safety rules and protocols at all times while in the lab.
- Any machining required for the construction of the robot must be done by a MEC 225-certified student.
- All tools can only be used inside the Robotics lab or the Solar Racing lab and cannot be borrowed outside the labs.
- Hazardous materials that pose a health and safety risk to participants shall not be used in the construction of a team's robot, nor shall the bot itself pose any health or safety risks. Any uncertainties should be clarified with the Vice President.
- In the case of an emergency, contact Campus Safety (631-632-3333) immediately and report the event to an e-board member.

# 4

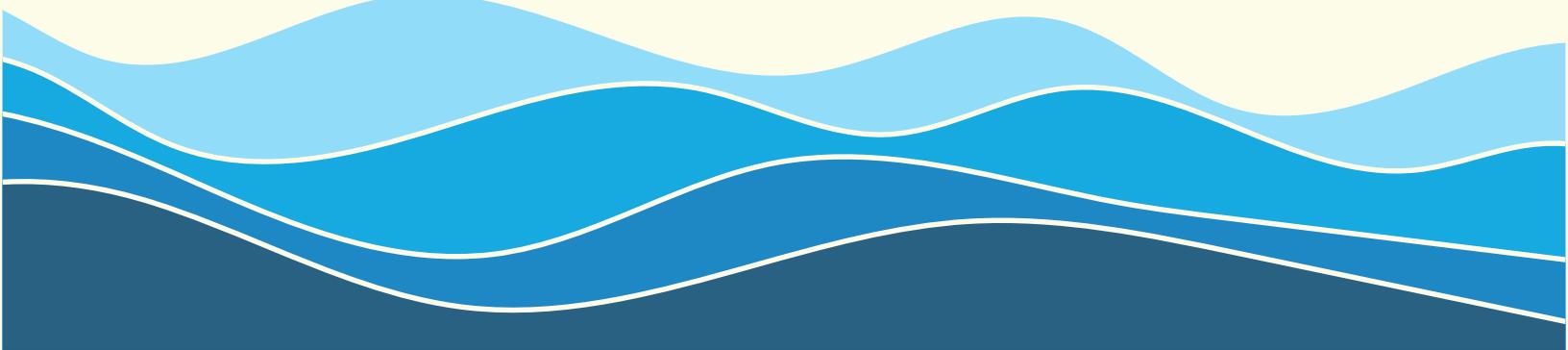
# COMPETITION INFORMATION

## A TEAMS

- Teams will consist of anywhere between 2 to 5 people competing with a single robot. Exceptions can be made but must be approved by an e-board member.
- Participants can register either as a group or individually.
- Once registered, teams are expected to participate throughout the competition. If a participant decides to leave the team at any point, another can be recruited to fill the vacancy.
- All participants must have completed the required safety documents before beginning work on their robot.
- Teams are expected to collaborate amongst themselves and split up the workload evenly. Any issues regarding failure to achieve such collaboration should be addressed to an e-board member.

## B GAMEPLAY

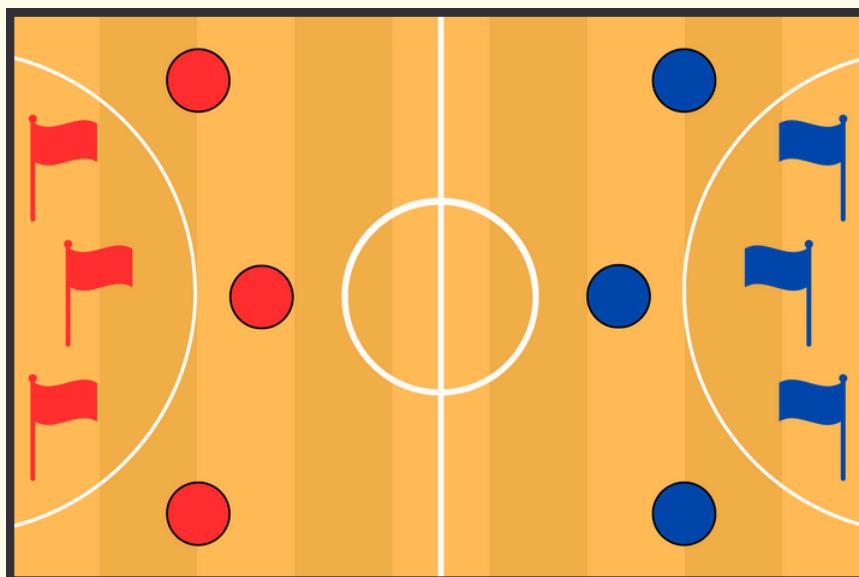
- A match will consist of 3 rounds, where 6 teams will play in a 3 versus 3 “Capture the Flag” game. Teams will be paired together randomly as an **alliance** and will work together to score points from the objective.
  - There will be 2 alliances of 3 teams that will progress together in the upper bracket until they lose. After a loss, the teams get dropped down to the lower bracket where they get paired with a new alliance to avoid elimination. After every game, alliances will be created with randomized teammates.
- There will be 7 flags present in the game with each being located at opposite ends of the field.
  - There will be 3 flags on each zone and 1 special bonus flag in the center of the field at every round. The bonus flag will be worth 1 point in round 1, 2 points in round 2, and 3 points in round 3.



## GAMEPLAY (continued)

- Rounds are 3 minutes long. Alliances will race to take the opposing flags and bring as many back to their zone while also defending their own flags from being taken by the opposing alliance.
  - A flag will be considered successfully retrieved if the alliance is able to bring it back to their zone as highlighted by the curved lines on the field.
  - Alliance members can attempt to steal their flags back from the opposing team.
  - By the end of each 3 min. round, the alliance with the most number of enemy flags successfully captured in their zone will be awarded 3 points.
  - At the end of every round, every team in the winning alliance will receive 3 points.
    - If by the end of the third round, there is a point tie between the alliances, then the game will move into a 1-minute overtime.
    - There will only be one flag on each side, and the first alliance to bring the opposing flag over to their zone or over the centerline of the field will win.
- The teams of the winning alliance will continue to progress in the upper bracket and the teams in the losing alliance will continue to compete in elimination games in the lower bracket.
  - The upper and lower bracket winners will face each other in the final match. The winner of the entire tournament will be determined by whichever team has accumulated the most number of points.
- A referee will be present to help facilitate and enforce the game structure.

## C FIELD



## FIELD (continued)

- The competition field will be 12' x 8'. There are two alliance zones located at each end and highlighted by the white curves against the field border. The centerline marks the middle of the field. The red and blue spots on the field mark the placement of a team's robot at the beginning of every round with their three alliance flags behind them.
- Games in both the upper and lower brackets will take place on the same field.

## D DISQUALIFICATION

- Not following the safety guidelines of the lab or posing a threat to the safety of others.
- Unsportsmanlike conduct, including but not limited to physical altercations, verbal abuse, or disruptive behavior.
- Attempting to damage or inhibit the performance of another team's robot.
- Cheating or rigging the match in a team or alliance's favor.
- Not following the approval processes.
- Taking or using lab materials without permission.
- Exceeding the design constraints as described in Section V.
- Discretion is made by referee and SBRT e-board.
- Teams cannot grab or lift flags off the ground.

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## ROBOT DESIGN

### A MECHANICAL

- Robots must be able to traverse the game field to move the flags back to the alliance zone. Teams can choose whether they wish to push or pull the flags back to their zone but are not allowed to lift the flags off the ground.
- Robots cannot include elements or mechanisms intended to damage another robot or impede its ability to compete.
- Robots will be limited to a maximum size of 10" x 10" x 10". Exceptions may be made for attachments but will be determined on a case-by-case scenario and must be approved by an e-board member.
- The frame of the robot and its components can utilize any material in the lab as listed in Section VI.

## B ELECTRICAL

- Teams will demonstrate their understanding of the electronics by following a schematic to design a prototype motor drive circuit on a breadboard.
- The circuits should utilize the Raspberry Pi Pico W, H-Bridge, motors, and any other additional electrical components. Circuit configuration must be approved before being allowed to power it using ONE 9V battery.
- Only ONE 9V battery is allowed to power your bot. Teams may use their additional battery to replace a low voltage or dead battery.
- Teams can choose whether to utilize their own breadboard circuit or use a PCB as the electronic circuit for their robot.

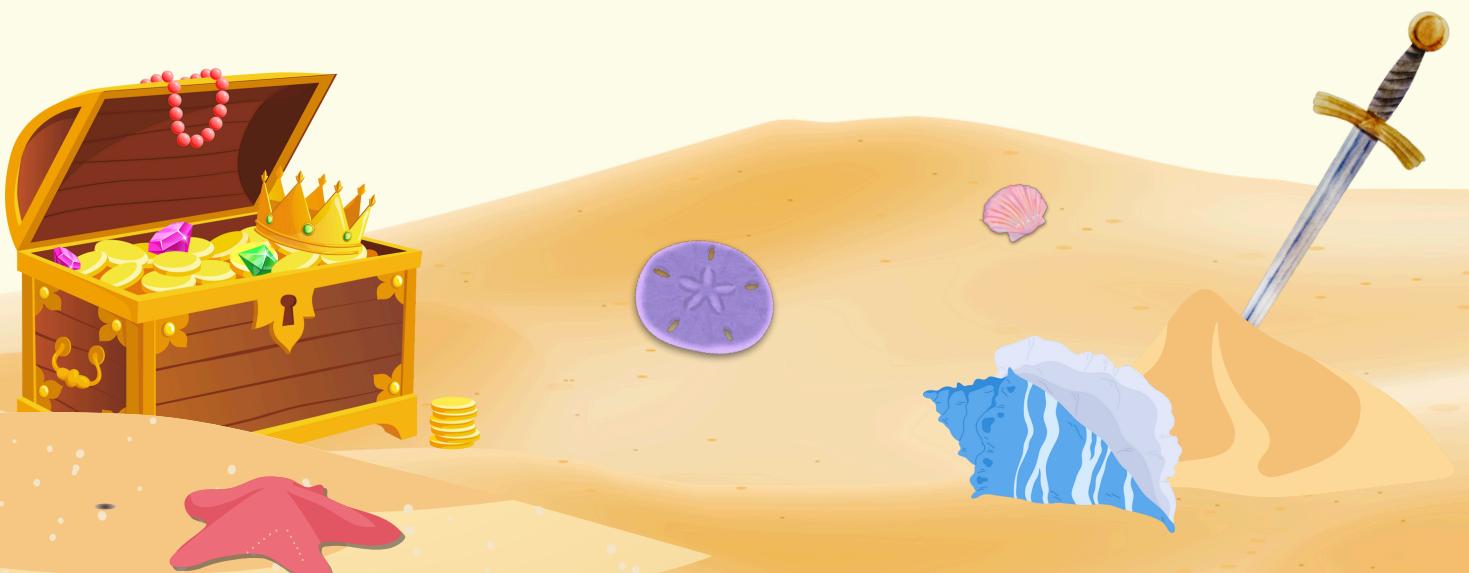
## C SOFTWARE

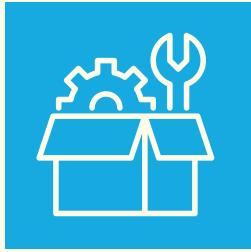
- Teams will design a front-end web-based controller using either a keyboard or touchscreen UI for their robot.
- The control interface will use WebSocket communication protocol for its reliability, minimal latency, and quick robot responsiveness.
- Teams will be expected to keep a log documenting their progress and any issues encountered.

# 6

## MATERIALS

- Teams will be provided a kit of essential electrical components needed to create a basic robot following the design criteria.
- Any materials available in the lab can be used to create the frame of the robot and other non-electrical components.
- Teams can request additional electrical components from an e-board member but must first be approved by the electrical team lead. Additional components must be adequately justified and serve a purpose in the overall design.





# AVAILABLE MATERIALS

Sheet of provided materials – see an e-board member to approve additional components!



## ELECTRONICS

- Raspberry Pi Pico W
- LEDs
- 9V Battery (2)
- 5000mAH power bank
- Other small electrical components per request



## BOARDS

- Breadboard
- PCB



## MOTORS

- Dagu Motors (4)
- Servo motor
- H-Bridge Motor Controller IC (2)



## BUILD

- Wood planks
- Acrylic sheets
- Hot glue
- Screws
- 3D printed parts

**F**

# WORKSHOPS

- Each team lead will host at least one workshop covering the fundamentals of their respective technical design and will provide information that will be necessary for the build and design of a robot.
- Workshops will involve a presentation and hands-on component. All workshop materials are provided during the workshop.
- At least one member from each team must attend each workshop. Failure to attend a workshop may result in disqualification. Exceptions can be made, but must be approved by an e-board member if you or your team cannot attend a workshop under these guidelines.

<b>Mechanical Workshop</b> Designing with CAD	<ul style="list-style-type: none"> <li>• Learn how to navigate and use Fusion360</li> <li>• Design a chassis for your robot</li> <li>• Export models for 3D printing</li> </ul>
<b>Electrical Workshop</b> Motor Control and Breadboard Prototyping	<ul style="list-style-type: none"> <li>• Learn the basics of breadboard prototyping</li> <li>• Design motor control circuit using H-Bridge</li> <li>• Program the circuit using MicroPython</li> </ul>
<b>Soldering Workshop (with IEEE)</b> PCB Soldering	<ul style="list-style-type: none"> <li>• Learn how to solder</li> <li>• Solder components onto PCB</li> </ul>
<b>Software Workshop</b> Web Server Communication	<ul style="list-style-type: none"> <li>• Learn how to implement websocket communication protocol</li> <li>• Set up a UI-based controller</li> <li>• Leverage Java and Python to program Raspberry Pi Pico W and controller</li> </ul>
<b>Overnight Build Session</b>	<ul style="list-style-type: none"> <li>• Evening-into-morning build session where teams can ensure their bots are running</li> <li>• Lab will be open so e-board can help with any mechanical, electrical, soldering, or software issues</li> </ul>

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# RESOURCES

**Click below to access design resources:**



## MECHANICAL

<https://shorturl.at/4N3iM>



## ELECTRICAL

<https://shorturl.at/rICG2>



## SOFTWARE

<https://shorturl.at/mTnYR>

- Workshops are the primary way for participants to build their robots. Teams are expected to participate in as many as possible.
- Lab hours are hosted by e-board members. The schedule for lab hours can be found posted on the SBRT Discord server, website, and lab door.
- If you need material to be machined, let an e-board member know so that a MEC 225-certified student can assist you.
- Do not be afraid to ask any e-board member for help! We understand that building a robot can be challenging, so we encourage you to reach out.

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**THANK YOU FOR PARTICIPATING IN  
SBRT INTERNAL COMPETITION 2024!**

**GOOD LUCK!**

