MECHMAYHEM RULE DOC. 2025

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1. Introduction

This document outlines the rules and requirements for all teams participating in MechMayhem—a high school robotics competition and Queensland University of Technology Aerospace Society (QUTAS) outreach initiative. The event will be held at the Queensland University of Technology (QUT), Gardens Point campus, on Saturday, 11 October 2025, as part of World Space Week. Twelve high school teams will compete, each with a combat robot of their own design, in an arena-style tournament.

Designing and operating combat robots involves inherent safety and legal risks. To ensure a safe and fair competition, it is essential that all teams follow the rules outlined in this document and respect the decisions made by QUTAS.

QUTAS reserves final authority over all rule interpretations and may disqualify any team for safety risks or misconduct. Teams are encouraged to send any questions over the validity of their design to QUTAS prior to construction.

2. General Rules

Please note that this rule document may be updated to clarify any vague guidelines (we will let participants know what has been changed). Safety is our top priority, so if you're ever unsure about a rule—especially one related to a potentially hazardous build—it is important to seek clarification before proceeding.

i. Entry Limits

a) Each school may submit a team with 4-5 student members (students must be from the same school)
b) One supervisor (must be from same school) allowed per team
c) Each team must submit a combat robot and may bring up to one identical backup.

ii. Code of Conduct

All participants are expected to uphold a respectful and professional environment throughout the competition. The following guidelines apply to all team members, supervisors, and spectators:

a) **No Sabotage**: Teams are strictly prohibited from tampering with, damaging (outside of matches), or interfering with another team's robot, tools, or workspace – whether physically or digitally.
b) **Good sportsmanship**: Teams are expected to show grace, encouragement, and professionalism toward one another. Mocking or intentionally demeaning others will not be tolerated.
c) **Respect the Judges' Decisions:** All participants must respect the verdict of referees/judges. If a team wishes to dispute a result, they must do so in a calm and respectful manner [see section 9].
d) **Appropriate Behaviour**: Unruly behaviour such as shouting, physical aggression, belligerence, or abusive conduct towards other teams, judges, or spectators is strictly prohibited.
e) **Team Accountability:** All participants are responsible for their own conduct and that of their team members and associated persons. Any form of cheating or disregard for rules may result in an enforced handicap, match forfeiture, or disqualification [see section 8].

f) **Respect the Venue and Equipment:** Teams must treat all competition property, venue facilities, and provided equipment with care.

3. Robot Specifications:

i. Size and weight limitations

Robots are limited to the following measurements:

a) Weight: 1.5kg
b) Dimensions (including extensions like arms, weapons, or deployable parts): 46cm width, 46cm length, 38cm height

ii. Materials

All robots must be constructed from materials deemed safe and appropriate for combat. The following list is not comprehensive but outlines major prohibited material categories.

a) Completely prohibited materials
   - Combustible organic substances (excluding solid wood and battery electrolytes)
   - High explosives, corrosives, flamethrowers, any other pyrotechnics
   - Liquids
   - Hazardous loose fibres
b) Prohibited on Robot exterior
   Any material that leaves behind a difficult-to-clean or toxic mess in the arena should not be used. This includes:
   - Glass, brittle ceramics (due to shatter hazard)
   - Foam rubber (not including solid rubber)
   - Rigid plastic foams (e.g., Styrofoam)
   - Lead metal

iii. Mobility

Bots may move using wheels, tracks, walkers, or similar ground-based mechanisms, although aerial or hovering technologies such as drones are prohibited.

All robots must be capable of sustained and intentional movement. This ensures fair engagement and prevents passive defensive strategies.
To enforce this:

- If a robot displays **no meaningful movement** (e.g., no attempt to advance, evade, or engage) for more than **30 consecutive seconds**, a **10-second countdown** will begin.
- If the robot fails to resume meaningful motion before the countdown ends, it will be considered **immobilized** and **eliminated**.
- Minimal or non-strategic motion—such as **twitching, spinning in place, or minor vibrations**—may still be ruled as inactivity at the judge's discretion.

iv. Weapons

Each bot must have at least one independently powered weapon that can significantly affect the operation of another bot.

Multiple weapons may be swapped between matches, as long as bots still meet weight and dimension requirements. Any weapon swapped in between rounds must **be re-inspected and approved by safety staff before use.**
Weapons must be designed for controlled impact, pushing/pulling strategies, and/or flipping the opponent's robot. A weapon-locking device is required to ensure no activation of weapons outside of the arena.

a) Approved examples:
   - Spinners
   - Flippers
   - Hammers
   - Wedges

b) Prohibited:
   - Sharpened blades or dangerous cutting edges
   - Projectiles: e.g., Guns, flamethrowers, nets, harpoons, gas sprays
   - Pyrotechnics: e.g., fire, explosions, smoke effects
   - Bright lights/lasers that are dangerous to human vision (weapons should only cause damage to the bots, not the human pilots)
   - Chemical Weapons: Acids, corrosives, sticky substances, powders, or gases that are dangerous and difficult to clean up.
   - Tasers
   - Pressurised gas canisters
   - No disruption of opponent's controller

Any weapon that could reasonably cause unintended damage or harm should not be used.

- **Creative weapon ideas should be sent to QUTAS for approval well before the competition date.**

Additionally, spinning weapons must not exceed an edge speed of 20m/s, which will be verified through a manual measurement process.

- Manual Edge Speed Check: Teams should provide a description of their weapon's rotation speed (e.g., using a stopwatch and a marked distance on the weapon or by counting rotations with a time-based approach)

$$\text{Edge Speed (m/s)} = \text{RPM} \times \text{Radius (m)} \times 2\pi \times \frac{1}{60}$$

v. Power source

a) Approved: Battery-Powered Robots (safe, portable, cost-effective).
Batteries must be securely mounted and easily accessible, and teams must be able to safely demonstrate they can turn power off/on. Wiring must be securely fastened and properly insulated to prevent shorts or damage during the battle (e.g., heat tube shrinking. The operating voltage of the system must not exceed 24V.
We recommend looking into FTC (FIRST tech challenge) battery recommendations/specifications if unsure.

b) Not Approved: Fuel-Powered or Combustion-Based Robots present significant fire and explosion hazards. In the context of a high school competition, these power sources are difficult to monitor and inspect safely.

vi. Component Protection

Batteries must be securely mounted and protected from direct impact or puncture during a typical match scenario. If a component is directly exposed to the opponent's weapon or primary area of impact without any barrier, additional shielding may be required.
Teams may be asked to add extra protection if their configuration poses a safety hazard.

vii. Remote Control

a) **Control Method:** Robots must be controlled wirelessly using an RC (radio control) or Bluetooth-based system. Wi-fi control is not recommended due to potential interference and connection instability in a shared event environment.
b) **Allowed frequencies:** Bots must be remotely operated using 2.4GHs RF systems. All control systems must be verified for safe and interference-free use.
c) **Signal interference policy:** Teams are responsible for ensuring their control system is reliable and interference-free. Controllers that support secure binding/pairing are highly recommended to avoid frequency overlap.
d) Any device found to cause **deliberate or repeated** RF interference — whether through misconfiguration, faulty hardware, or malicious intent — may result in penalties or disqualification at the discretion of the judges.

viii. Light Target Requirement

Each robot must have a clearly visible and unobstructed LED light target mounted on the top or rear-top section of the robot for the opposition to destroy (no recessed or shielded positions). **Teams will mount the LED *(provided by QUTAS)* in accordance with the following placement rules:**

a) The base of the lamppost must be securely attached no more than 3 cm above ground level.
b) The entire LED and lamp post must be positioned on the edge of the robot.
c) The LED must be exposed such that it can be attacked from any direction within a full hemisphere (180° field of access), at a minimum distance of 8 cm.

ix. Important

Robots must comply with both these rules and the law!

4. Arena Rules

i. **Arena Dimensions**: The arena will be a fully enclosed combat zone, measuring 2.5m x 2.5m, with an out-of-bounds perimeter. It will feature a flat, non-flammable, and impact-resistant floor. The pilot zones will be located at opposite ends of the arena.
ii. **Starting Positions**: Bots must begin each match in their designated corner, fully stationary. A countdown will signal the start of each match.
iii. **Safety rules**: No humans or objects are allowed inside the arena once the match has begun. Teams are not allowed to enter any extra support vehicles/objects for their

bots into the arena. All bots must undergo safety inspections before entering the arena [see section 7.]. Only team members are allowed in the pilot zone.

The match will end if a robot is immobilized, ejected from the arena, declared unsafe by the judge(s), or if a time-out occurs. In case of a time-out, judges will impartially select a victor.

5. Match Format

Mech Mayhem will feature 12 teams and 3 rounds in a single elimination tournament format. Each round will last up to a maximum of 8 minutes.

In the first round, 6 matches will be held, with the winner of each advancing to the second round. From there, 3 teams will emerge victorious and move on to the finals.

The final round will consist of 3 matches, allowing each finalist team to compete against the other two. The overall winner of the competition will be team that achieves the most wins in the final round.

6. Judging Criteria

The winner for each match will be determined within an 8-minute time limit based on the following conditions (and refereed by a judge):

- **Last Bot Standing**: A team wins if their opponent's robot is destroyed. This includes being visibly disabled, unable to respond to any inputs, or immobile for at least 10 consecutive seconds.
- **Ring out**: If a bot is removed entirely from the arena square, it is automatically considered defeated
- **Light Target Rule**: Each robot will be equipped with a designated light target. If neither bot is destroyed or removed from the arena within the time limit, the winner will be the first to have successfully destroyed their opponent's light.
- **Active Movement Requirement**: Bots must demonstrate continuous engagement to prevent bots from just sitting and defending. If a bot shows no movement at all for more than 30 seconds, a 10-second countdown will begin. Failure to resume movement during this countdown will result in elimination.

To summarise, the objective of each match is to: destroy the other bot, push it out of the arena, or destroy its light target, whilst proactively engaging in combat. With these goals in mind, teams are encouraged to develop creative and strategic approaches to achieve victory.

Match outcomes will be determined using camera footage and the verdict of an impartial judge/referee to ensure a fair and accurate verdict.

7. Inspection and Testing (Safety)

Before competing, all robots must pass a mandatory inspection and testing process to ensure they meet safety, design, and performance standards. At the discretion of the event's safety inspectors, teams may be given a time limit to fix a failed element of the safety test, lest their robot be disqualified. This process is essential to maintain fairness and protect all participants, referees, and spectators.

a) On the day, the following criteria must be met:

- Weight Limit (1.5kg)
- Size Limit (46cm x 46cm x 38cm)
- Power Source (only battery-powered bots permitted; LiPo batteries must be concealed in a safety bag; position of battery – battery needs to be protected from hits)
- Power on/off switch; needs to be safely accessible (e.g., completely clear of the weapon)
- Weapon Safety (no prohibited weapons)
- Failsafe systems (emergency power stop mechanisms); automatic shutdown of weapon and bot motion within 2-5 seconds of signal loss from transmitter
- Manual E-stop: kills all power immediately (wire-pull)
- Light Target must be securely mounted on visible and reachable section of bot
- Structural integrity: all components need to be firmly attached
- Demonstration of safe mobility (robot must be able to be driven in and out of arena without human entry)

b) Each team must also submit their chosen design to QUTAS before the competition to ensure safety

c) Repairs Between Matches

Between matches, teams will be allowed to perform repairs using only the materials provided by the event organisers, including a limited supply of tape, zip ties, and basic hand tools.

To ensure fairness:

- **No external components, power tools, adhesives, or soldering equipment** may be used unless explicitly approved by QUTAS officials.
- Replacement parts may only be installed **if they are identical to the original components** and have been **pre-approved** during the initial inspection.
- Any modifications, swaps, or upgrades beyond basic repairs will require **re-inspection before the next match**.

Important: Teams should design their robots with durability and ease of repair in mind, as access to spare parts and advanced tools will be restricted on the day.

8. Penalties and Disqualification

Robots or teams may be penalised or disqualified if they fail to comply with competition specifications of engage in unsafe, dishonest, or unsportsmanlike conduct. All rulings are made at the discretion of the judges and referees whose decisions are final.

a) Disqualification Criteria:

- Exceeds size or weight limits
- Uses banned weapon types
- Lack required safety features
- Failure to pass functionality or failsafe tests
- Cheating, bribery, or dishonesty during inspection or judging
- Intentional tampering with arena systems, scorekeeping, or electronics

b) Penalty Criteria

- **Minor Penalties (first offense = warning)**
- Unsportsmanlike behaviour

- Unauthorized touching robot during inspection
- Failure to follow arena protocols (e.g., starting combat before countdown finishes, entering the arena after the match has begun)
  - **Major Penalties (immediate consequences)**
- Attempting to conceal disallowed components
- Swapping components without re-inspection
- Intentional stalling or passive behaviour intended solely to avoid engagement — including remaining motionless, avoiding combat entirely, or exploiting time limits to win by default — will be considered time-wasting and may result in penalties.
  Note: Defensive tactics such as retreating, repositioning, or strategic disengagement are allowed, provided the robot continues to demonstrate active control and intent to re-engage. This rule exists to ensure that matches involve meaningful interaction and do not devolve into purely defensive standoffs — where neither side earns a clear victory.

- Repeated minor penalties may escalate to major penalties or disqualification

  - Penalty Consequences
- Bot handicap: e.g., limited battery output or motor speed, specific weapon restrictions or temporary disabling
- 3-second delay before bot activation
- Driver Control Restriction: one-handed driving only
- Reduced match time

9. Appeals and Complaints

Whilst all efforts will be made to ensure fair and consistent judging, participants have the right to raise concerns through an official process. Appeals must be made respectfully and in accordance with the following guidelines:

a) Submitting an Appeal
   - Appeals must be submitted within 10 minutes of the match's conclusion
   - Appeals must be submitted to the judge or referee
   - Appeals must be clearly stated and specify the rule or incident in question

b) Valid Grounds for an Appeal
   - Alleged violation of the rules by the opposing team
   - Suspected misjudgement or error in scoring
   - Procedural error (e.g., incorrect start of safety breach by the organisers)

c) Review Process
   - The head judge and event staff will review footage, inspect relevant bots, and consult other officials as needed.
   - A decision will be made and delivered to involved teams within 20 minutes of the appeal being received.
   - All decisions made after appeal review are final

d) Inappropriate Complaints and Additional Notes
   - Teams are encouraged to always maintain sportsmanship and professionalism, even in disagreement
   - Disrespectful, frivolous, repeated, or baseless appeals may be ignored at the judge's discretion

10. Acknowledgements and Liability

a) Participant Acknowledgements

By entering the competition, all participants acknowledge and agree to the following:

- They have read, understood, and agreed to abide by all rules and safety regulations outlined in this document
- They are responsible for the design, construction, and operation of their robot in a manner that ensures safety to themselves, others, and the environment
- They understand that participation involves inherent risks, including but not limited to mechanical failures, minor injuries, or accidental damage to equipment.

b) Liability Disclaimer

- QUTAS, QUT, sponsors, or affiliated staff shall not be held liable for any injuries, loss, or damages incurred during or because of participation in the event
- Participants compete at their own risk and are responsible for ensuring their robot complies with all safety protocols

11. Evacuation Plan

In the event of an emergency—such as fire, hazardous material exposure, electrical failure, or structural instability—all participants, staff, and attendees must follow the evacuation procedures outlined below. This plan is designed to ensure the safety of all individuals and facilitate the prompt response of emergency services.

1. Evacuation Triggers

Evacuation will be initiated under the following circumstances:

- Detection of fire or smoke, including incidents involving lithium polymer (LiPo) batteries (e.g., swelling, sparking, or thermal runaway).
- Structural or environmental hazards rendering the venue unsafe.
- Instruction by safety officers, venue staff, or emergency services personnel.

2. LiPo Battery Safety Protocol

Due to the fire risk associated with LiPo batteries, strict procedures must be followed:

- All charging and storage of LiPo batteries must occur in the designated fire-safe zone located at **** (TBD)*.
- In the event of a suspected or confirmed LiPo battery fire:
    - Do not attempt to extinguish the fire unless trained and equipped to do so.
    - Immediately notify a safety officer and activate the nearest fire alarm.
    - Evacuate the area following the instructions below.
    - Fire suppression materials, including Class D extinguishers and/or sand buckets, will be stationed near all battery zones.

3. Evacuation Procedure

1. Cease all activities immediately upon hearing the evacuation alarm or being instructed to evacuate.
2. Exit the venue via the nearest safe exit as outlined in Evacuation Routes (part 4).
3. Proceed calmly and directly to the designated evacuation zone located at the Kidney Lawn, Gardens Point.

4. Do not return to collect personal belongings or equipment unless explicitly authorised.
5. Remain in the evacuation zone until accounted for and given clearance to re-enter by authorised personnel.

4. Evacuation Routes

The venue has multiple designated exit points to facilitate safe and efficient evacuation. These include:

- Primary Exits:
  - *Exit 1 – Main Entrance (through O block hallway)*
  - *Exit 2 – Industry, roll-up door (through to P block)*
- Evacuation signage will be clearly displayed throughout the venue.

5. Assembly and Accountability

- All teams must report to their designated team leader or assembly coordinator upon reaching the evacuation zone.
- Safety officers will conduct a headcount and report to the event coordinator.
- Any missing individuals must be reported immediately to emergency services.

6. Roles and Responsibilities

- Safety Officers: Coordinate evacuation, assist individuals requiring help, operate extinguishers if safe to do so.
- Team Supervisors: Ensure their teams evacuate promptly and are accounted for.
- Event Coordinator: Liaise with emergency services, oversee overall evacuation process, and determine re-entry protocol.

7. Re-entry Procedure

Re-entry to the venue is strictly prohibited until it is declared safe by the event coordinator in consultation with emergency services or venue staff.