⚙️ INNOVATEX 4.0 – Presidency University

MakerSpace Cluster | Standard Rule Book Format

🧠 Event Overview

Event Name	COBOTS – Collaborative Robotics Challenge
Cluster	MakerSpace Cluster
Event Type	Robotics Competition
Mode	Offline
Team Size	3 to 4 members per team
Duration	Half-Day — 9:00 AM to 1:00 PM
Venue	Indoor hall, minimum 8m x 8m clear floor space
Max Teams	8 teams (first-come-first-served registration)
Budget Cap	Rs. 15,000 per team for both robots combined

🎯 Event Task / Objective

Each team builds two robots that work together to complete a single Search and Retrieve mission inside a 6m x 6m obstacle arena.

Bot	Name	Job
Bot 1	**Scout Bot**	Moves through the arena fully autonomously. Uses sensors to map obstacles, find the payload (yellow tennis ball), and wirelessly transmit the map and payload location to the Arm Bot operator in real time.
Bot 2	**Arm Bot**	Operated semi-manually by one team member using the Scout's live map on a laptop screen. Navigates to the payload, picks it up using an onboard gripper arm, and brings it back to the home base.

Both bots are active in the arena at the same time. The mission is complete when the payload is deposited inside the home base zone. The run timer stops at that moment or at 12 minutes — whichever comes first.

⚙️ Design / Technical Specifications

Specification	Scout Bot	Arm Bot
Max Dimensions	25 cm x 25 cm x 25 cm	25 cm x 25 cm x 25 cm
Max Weight	3 kg	3 kg
Max Battery	12V, 3A continuous	12V, 3A continuous
Fuse Required	Yes — mandatory	Yes — mandatory
Microcontroller	Arduino / ESP32 / Raspberry Pi	Arduino / ESP32 / Raspberry Pi
Control Mode	Fully Autonomous (mandatory)	Semi-autonomous or manual (allowed)
Communication	NRF24L01 or 2.4GHz WiFi — transmitter	NRF24L01 or 2.4GHz WiFi — receiver
Sensors (minimum)	3x Ultrasonic + IMU + Colour sensor	1x Ultrasonic front (failsafe minimum)
Payload Gripper	Not required	Required — servo-based claw or scoop
Chassis	Self-fabricated — no kits	Self-fabricated — no kits
Build Budget	Part of Rs. 15,000 combined cap	Part of Rs. 15,000 combined cap

Prohibited Components & Practices:

- Pre-built robot kits (Lego Mindstorms, Arduino Robot Kit, etc.) are strictly prohibited. Chassis must be fabricated by the team.
- Onboard cameras may be used for sensing but live video relay to the operator during a run is not permitted.
- The Arm Bot operator may NOT use independent sensors on the Arm Bot to locate the payload — it must rely solely on the Scout's transmitted map.
- Pre-mapping the arena or hardcoding obstacle positions before the run is not permitted. The obstacle layout changes before every team's run.
- Commercial drone or ground vehicle platforms used as-is are not permitted.

🧩 General Guidelines

1. All teams must register before the deadline. Walk-in registrations will not be accepted on event day.
2. Teams are responsible for bringing both fully assembled and tested robots, all tools, spare parts, and charging equipment. The organisers provide only the arena and power outlets.
3. Both robots must be entirely built by the team members. External builds, commissioned fabrication, or purchased assemblies beyond individual components are not allowed.
4. Teams must submit a Bill of Materials (BOM) with component names and prices at the time of bot inspection. Budget violations result in disqualification.
5. Each team must declare their Scout Bot control mode before the run — Fully Autonomous, Assisted Autonomous, or Semi-Autonomous. This declaration cannot be changed after it is made.
6. Once a run begins, no team member may communicate with, touch, or signal either bot in any way beyond the declared control method.
7. The Arm Bot operator must use only the Scout's wirelessly transmitted map. Manual data relay — verbal, written, photographic, or otherwise — is not permitted and results in immediate score penalty.
8. Teams are responsible for the safety of their bots at all times. Any bot that poses a risk to participants, spectators, or the arena will be stopped immediately.
9. Respect for judges, fellow teams, volunteers, and spectators is mandatory. Any unsportsmanlike conduct will result in disqualification.
10. Decisions made by the Head Judge are final and binding. Written appeals may be submitted within 5 minutes of score announcement — verbal appeals will not be considered.
11. All participants must follow Presidency University venue and safety policies throughout the event.

🔋 Safety Rules

- All bots must be battery-powered only. No mains-powered connections inside the arena under any circumstance.
- Maximum battery voltage is 12V. A fuse or polyfuse must be present in every bot's main power circuit. Bots without a fuse will fail inspection and will not be permitted to run.
- All exposed metal parts must be filed smooth or covered with insulation tape. No sharp edges are permitted on any external surface of either bot.
- LiPo batteries must be transported and stored in LiPo-safe bags. Damaged, swollen, or punctured batteries are strictly prohibited at the venue.
- No team member may enter the arena boundary at any time during a run. Violation results in immediate run termination with zero score for that attempt.
- In the event of smoke, fire, or any electrical hazard, the Safety Officer will immediately cut power and clear the area. The team will be removed from the arena.
- A CO_2 fire extinguisher and first aid kit must be accessible within 3 metres of the arena at all times during competition runs.
- Spectators and non-competing team members must remain outside the designated spectator boundary at all times.
- Any bot emitting unusual smells, sparks, or sounds must be immediately powered down and removed from the arena by the team.
- The Safety Officer's instructions are to be followed immediately and without question. Refusal to comply results in disqualification.

🧱 Event Rounds / Structure

Round	Time	Duration	Description
Round 1 Opening	9:00 – 9:20 AM	**20 min**	Welcome address, rules briefing, run-order draw, control mode declaration by all teams.
Round 2 Inspection	9:20 – 9:40 AM	**20 min**	Bot inspection at two parallel stations. Checks: dimensions, weight, battery, fuse, wireless link, gripper function, BOM review.
Round 3 Walkthrough	9:40 – 9:50 AM	**10 min**	All teams walk around the arena. Obstacle layout shown. Final questions answered. Arena sealed after this.
Round 4 Competition	9:50 AM – 11:50 AM	**120 min**	8 teams run sequentially. Each team gets one 15-minute slot: 2 min setup + 12 min mission + 1 min reset.
Round 5 Deliberation	11:50 AM – 12:10 PM	**20 min**	Judges finalise scores. Multipliers and penalties applied. Scoreboard prepared.
Final Ceremony	12:10 – 1:00 PM	**50 min**	Score reveal, prize distribution, certificates, group photo, closing remarks.

Per-Team Mission Slot (Round 4):

Time in Slot	What Happens
0:00 – 2:00	Setup — team places both bots in home base. Judge confirms inspection sticker and payload loaded in Arm Bot gripper.
2:00	Scout Bot activated — autonomous run begins. Timer starts. Arm Bot remains at home base on standby.
~4:00 – 5:00	Scout locates yellow payload, transmits coordinates wirelessly. Arm Bot operator's laptop shows payload location on map.
Immediately	Arm Bot operator activates. Navigates using Scout's live map to reach payload. Scout continues mapping.
Before 14:00	Arm Bot grips payload, returns to home base, deposits it inside the zone. Timer STOPS. Mission complete.
14:00	Hard time limit. Run ends regardless of mission status. Judges assess final state.
14:00 – 15:00	Arena reset by volunteers. Next team enters.

🧾 Submission Guidelines

The following must be submitted at bot inspection before the team is cleared to compete:

- Bill of Materials (BOM) — printed or on phone — listing every component used in both bots with individual prices and total cost. Must be under Rs. 15,000 combined.
- Control Mode Declaration Form — one per team, signed by team leader. Declares Scout Bot control mode: Fully Autonomous / Assisted Autonomous / Semi-Autonomous.
- Wireless Frequency Declaration — RF module name and channel/frequency used. Required for channel conflict management between teams.
- Both robots physically present for inspection — both bots must pass inspection before either is allowed to compete.

Teams that arrive at inspection without their BOM or Control Mode Declaration will be given 10 minutes to produce it. If still unavailable, the team forfeits their run slot and is placed at the end of the queue, subject to time availability.

🧑‍⚖️ Judging Criteria

Criteria	Weightage	How It Is Judged
Scout Bot — Autonomous Arena Coverage	**24%**	Judge tracks which zones the Scout covers on a grid map. Full coverage of all 3 zones = full marks. Pro-rated for partial coverage.
Scout Bot — Payload Detection & Transmission	**16%**	Did the Scout correctly locate the yellow payload and transmit its coordinates wirelessly? Verified against actual position.
Arm Bot — Navigation Using Scout Map Only	**20%**	Did the operator use only the Scout's transmitted map? No independent sensing. Judge observes and verifies. Bonus for efficient routing.
Arm Bot — Payload Pickup	**20%**	Was the payload successfully gripped and transported? Partial marks if picked up but dropped before reaching home base.
Mission Complete — Payload in Home Base	**20%**	Payload fully inside the 50x50 cm home base zone when Arm Bot releases it. Partial if touching the boundary.

Time Bonus:

- Mission completed in under 8 minutes — +20 bonus points added to final score.
- Mission completed between 8 and 12 minutes — no bonus.
- Mission not completed by 12 minutes — no bonus. Partial scores apply for all criteria achieved so far.

💰 Scoring Overview

Parameter	Max Points	Notes
Scout — Arena Coverage (3 zones)	**60**	20 pts per zone
Scout — Payload Located & Transmitted	**40**	All or partial
Arm Bot — Navigation via Scout Map	**50**	Includes path efficiency
Arm Bot — Payload Pickup	**50**	Full or partial
Mission Complete — Home Base Deposit	**60**	Full or partial
Time Bonus (under 8 min)	**20**	Bonus only
TOTAL (before multiplier)	**260 + 20 bonus**	

Scout Bot Control Mode Multipliers

Mode	Multiplier	What It Means
Fully Autonomous	**1.0x**	Scout navigates and maps entirely on its own code with zero human input during the run. Full score.
Assisted Autonomous	**0.8x**	Scout moves autonomously but operator may press one button to re-orient if the bot gets stuck.
Semi-Autonomous / RC	**0.6x**	Operator controls Scout movement. Sensor-based obstacle avoidance still active.

The multiplier applies only to Scout Bot scoring criteria (Coverage + Detection). Arm Bot scores and Mission Complete scores are not affected by the multiplier.

🚫 Penalties & Disqualifications

Violation	Penalty
Scout Bot exits arena boundary (per occurrence)	**-10 points per exit**
Obstacle physically displaced by either bot (per obstacle)	**-5 points per obstacle**
Manual data relay instead of wireless transmission	**-30 points + navigation bonus forfeited**
Arm Bot uses independent sensors to locate payload	**-20 points**
Team member enters arena during a run	**Run terminated — zero score for that run**
Pre-built kit chassis used	**Disqualification from the event**
Budget limit exceeded (Rs. 15,000)	**Disqualification from the event**
Bot emits smoke, sparks, or catches fire	**Run terminated — safety review before re-entry**
Unsafe battery (swollen, unprotected LiPo)	**Bot barred from competing until battery replaced**
Misconduct or unsportsmanlike behaviour	**Disqualification from the event**
Plagiarism or copied design from another team	**Disqualification from the event**

🏆 Awards & Recognition

Category	Prize	Remarks
1st Prize	₹30,000	Winner
2nd Prize	₹20,000	Runner-up
3rd Prize	₹10,000	Technical Merit

🧭 Event Team

Role	Name	Department / Club	Contact
Faculty Coordinator	Dr.Divya rani	Dept. of electronics and communication engineering	-
Student Event Lead	Rishikesh yadav	1st year , CSE	866074356

📋 General Instructions

- Follow all Presidency University and MakerSpace cluster policies throughout the duration of the event.
- Respect all judges, peers, volunteers, and support staff at all times. The event is a professional competition environment.
- Any form of plagiarism, copied design, or reuse of another team's work will result in immediate disqualification of the offending team.
- Decisions of the judges are final and binding. Only written appeals submitted within 5 minutes of score announcement will be considered.
- Participation certificates will be awarded to all valid participants who complete their run — regardless of score or mission outcome.
- Teams are encouraged to document their build process — photos, short videos, and notes — for their own learning and for sharing with the INNOVATEX 4.0 media team.
- Any changes to the rules or schedule will be communicated officially via the INNOVATEX 4.0 WhatsApp community and the event notice board. Verbal announcements alone are not considered official.

Teams found misrepresenting their budget, control mode, or component sourcing will be disqualified without appeal.

⚡ Official Note

This Rule Book serves as the official guideline for all MakerSpace Cluster events under INNOVATEX 4.0, Presidency University.
Any updates or clarifications will be communicated officially via the MakerSpace WhatsApp community and notice board.