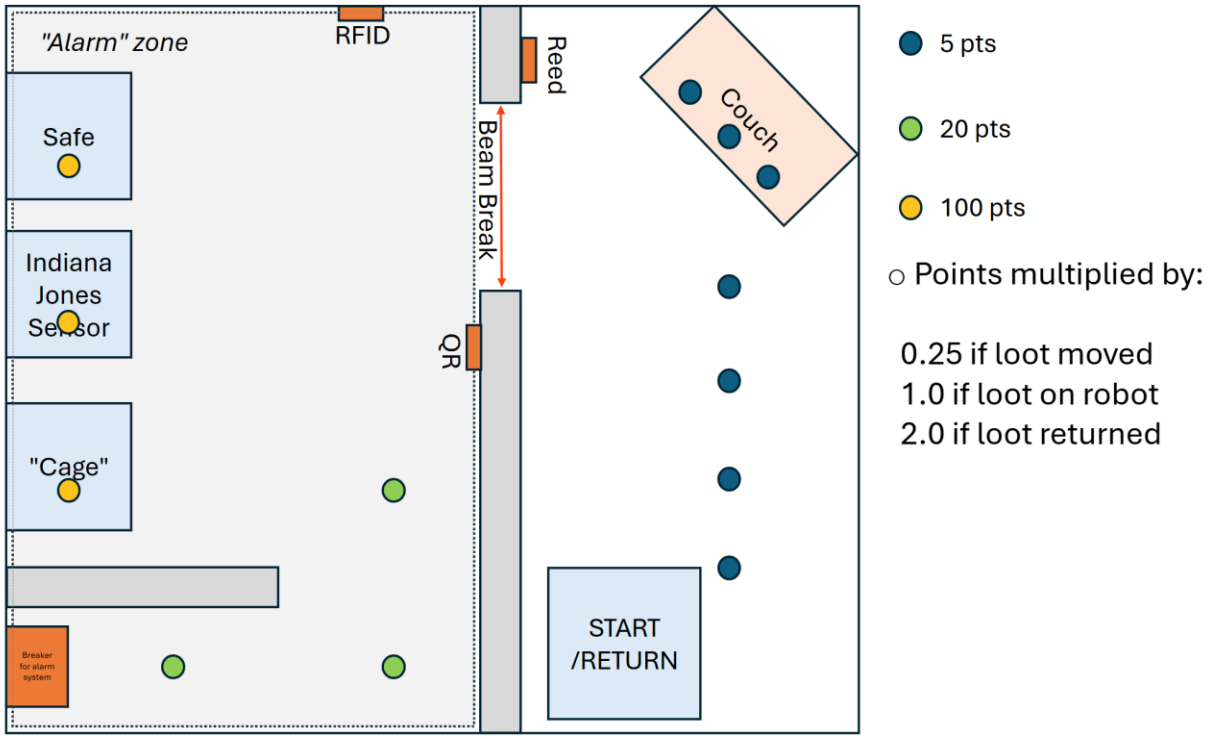
2025 Peter Gregson Design Challenge
Map, Rules, and Scoring



THIS MAP IS NOT TO SCALE. SEE DETAILED COURSE NOTES FOR MORE INFORMATION.

RULES

General Rules:

1. Robots must operate safely without endangering the users or the public. A pre-inspection of your robot will be performed, and only approved robots are permitted in the building/on the course.

   NOTE: This rule is as relevant to Dalhousie health & safety. There may be other people around on competition day, and we need to meet Dalhousie safety requirements.

2. No modifications to the course structure, obstacle, or features are permitted. This means your 6, robot cannot "ram" obstacles or physically break into the challenges.

3. No pneumatic/hydraulic actuation, no gas/aerosol/liquid systems of any kind are permitted. Small amounts of lubrication or cooling are allowed as long as the use is not pressurized, cannot leak, and is not used to transfer power.

4. No voltages over 24V are permitted. You may add additional batteries, but cannot have a total voltage on board over 24V (this is related to health & safety / rule # 1).

5. Only one physical robot can be deployed; it may then separate on the course if designed to do so.

6. Your team of 5 students is one group. One group is permitted ~~4~~ 10 attempts on the course, or, a total of 15-minutes, whichever condition is fulfilled first. There is up to 2 mins between attempts to reset the course and similar which is not counted in the 15-min timer. ~~No changes to the robot can be done with the exception of switch changes (see rule 9).~~ [UPDATE: THIS HAS BEEN REMOVED]

7. Only parts provided in the initial kit and those with a total value of up to $300 can be used. Small hardware and 3D printed parts are also acceptable. You may choose to use sensors you already have, but you must account for them in the total cost (and your flexible budget can then be spent on other purchases).

8. The diameter and height of the robot must be less than 40 cm, and will need to fit inside the starting box.

9. The robot must be autonomous, no manual controls or commands are permitted when deployed. **Robots must be delivered and ready by 9am, Challenge Day.** ~~**Modifications will NOT be allowed once the robot is delivered.** You may choose to have different operating modes your robot switches between, the mode is selected by a switch on the breadboard or similar. You can change modes between runs but NOT perform code changes.~~ [THIS HAS BEEN REMOVED, NEW RULE FOLLOWS] You may modify the robot within your time slot, but this is counted against your competition time (does not "stop the clock"). You may NOT add anything physically to the robot – you may reconfigure items but everything must be with your robot at 9am on competition day. You may NOT for example finish printing an item and add that to your robot later in the day.

10. Robots and teams are expected to follow university and professional engineering policies and ethics guidelines. Teams may lose their professionalism marks or be ejected from the contest for breaking these conditions. Examples of this include but are not limited to interfering with other contestants, for example by attempting to interject interference into their sensors.

11. These rules may be amended & modified as required.

11-A. The robot platform must be returned in the same condition it was handed out as. No adhesives or tape may be used to connect to the robot platform. The provided bolt holes should be used for attachment. Do not change the platform by soldering, disassembling, etc.

NOTE: If you plan on using adhesive or tape, simply have a small "extension" printed you bolt to the robot base, and then you can glue to your 3D printed extension.

Course Dynamic Rules:

12. Alarms with 45-second countdowns will be triggered by the beam break detector and certain other course challenges, such as entering the installer code on the safe. If the alarm goes off (45 seconds after it is triggered) this ends your attempt. Once the alarm goes off the following items will be reset when your robot is returned for it's next run:
    a. The breaker is returned to the ON position (alarm is active).
    b. The safe, if open, is closed.
    c. The cage is returned to the state just before the alarm was activated (if open before the alarm, remains open, if closed remains closed).

13. The alarm can be disabled in various ways as described in the course challenges. Your turn continues as normal if you stop the alarm from going off before the timer expires.

14. Any points up to the point the alarm goes off continue to count, and points after the alarm goes off do not count.

15. You can only score any given objective once. That is once a loot is collected you cannot get points for the same loot on future runs unless you choose to reset the entire course in which case your marks also reset back to zero.

16. When performing another attempt, you may choose to have objects (loot and challenges) reset OR left as they were from your previous attempt. If you choose to have the objects (loot & challenges) reset then your score also resets to zero.

16-A: The SAFE is always reset to 0 (unless a request not to do so was made).

17. The safe MAY be opened by the "top knob". If this happens the alarm starts the 45-second countdown (unless alarm power was disabled). This is only used to receive points for the loot retrieval, it does not award any challenge points.

18. For the purpose of the "Marie Kondo Disciple" challenge and the "Loot Collection" on competition day, loot that is stored "on" your robot is defined as follows:

    If your robot is moved in any direction the loot remains "captive" and counts as "stored on robot", even if it is touching the ground. This may be tested by physically moving the robot.

    For example, the following all meet the definition of "collecting" loot for both the 1x point multiplier and the Marie Kondo disciple:

    - A storage system that loads loot into a basket on your robot.
    - A claw that closes fully around multiple pieces of loot.
    - A one-way ramp that pushes loot onto a platform.

An open “C shape” that requires your robot to drive forward only does not have full control over the loot. If you drove backwards, the loot will become free. This applies even if your logic “should” prevent that – the loot collection must remain secure.

19. Teams may opt to remove any piece(s) of loot from the board before their run. These pieces are not eligible for points.

RULE CHANGELOG:

Date	Rule	Change
Jan 9, 2025	15, 16	Clarified that you can choose to reset the course or not (which also resets score).
Jan 9, 2025	12	Added description of what happens on course reset with alarm.
Jan 9, 2025	3	Clarified that small amounts of lubrication are allowed.
Jan 9, 2025	11A	Clarified that robots must be returned in same condition without using tape or adhesive, and added clarification about possible uses.
Jan 9, 2025	7	Clarified that $300 limit is total of add-ons, you can choose to use existing sensors, and spend the flex budget elsewhere (tools for your purpose etc).
Jan 9, 2025	6, 9	Clarified that while code changes cannot happen on competition day, you can change modes using a switch or similar.
Jan 23, 2025	--	Updated course map
March 3, 2025	--	Updated deadline for scoring: Made it clear demos CAN occur on March 19th (before comp day). Also clarified that you can choose to use your competition time for “demos” instead of runs if you want (but total time is the same).
March 7, 2025	16A	Added note that safe is reset to 0 in all restart attempts.
March 7, 2025	17	Added note that safe can be opened using knob on the electromagnet
March 10, 2025	6, 9	Removed requirement to avoid modifying robot within your timeslot, but clarified this counts against your time limit.
March 12, 2025	18	Defined what “on” means
March 19, 2025	6	Upped runs to 10
March 19, 2025	-	Added penalty scores
March 19, 2025	19	Added rule about removing loot
March 20, 2025	12	Clarify cage position on reset

SCORING – ROBOT OPERATION

The following scoring metric is used for the "Robot Operation" portion of your mark (15% of grade). You may choose to demonstrate each of these during one of these periods:

- Before the competition up until the end of the lab time on March 13th
- During the scheduled per-team time on March 19th for final robot checks.
- During the competition day (March 20th). If demonstrating on competition day your time comes out of the competition run time. No additional time will be provided.

Specific Details of each challenge will be posted – there is more required to accomplish each goal than just the basic description here. You must accomplish it fully to get the points. There are NO partial points for the challenges.

You can have a maximum of fifty (50) points to get 100% on this portion. There are more than 50 points available.

Navigation:

1 pt: Basic Walling: Drive through the wall opening (beam break) - 1 pt

2 pt: Advanced Walling: Drive through the wall opening (robot fully across) & return to starting zone

2 pts each (max 6 pts): Waypoints: Drive to one of the Safe, Indiana Jones Sensor, Cage/Drop. Must face the challenge (within 5 degrees) and be within marked scoring zone (may differ for each).

Challenges:

5 pt: Ninja Mode: Pass through the beak break detector undetected *without* disabling it - 5 pts

5 pt: Bomb Disarm: Find the magnetic switch & disable the beam break detector (*cannot* collect ninja mode points if you disable it, you must demonstrate ninja mode with beam break enabled) - 5 pts

5 pt: Decoded: Read the QR code on the wall (need to print to terminal to confirm read correctly) - 5 pts

5 pt: Carded: Robot swipes the RFID badge that disarms the alarm - 5 pts

10 pt: Indy Mode: Remove the loot without tripping the sensor - 10 pts

10 pt: Safe Cracker: Unlock the safe - 10 pts

10 pt: Safe Robber: Remove the loot from the unlocked safe (requires safe cracker to work)

Marie Kondo Disciples:

5 pts Max: Store loot on your robot, up to 5 pts (1 pt per loot stored in ONE run). Loot will be setup in a specific pattern.

Bonuses:

10 pt: Hack the World: Use a 802.15.4 interface to disable alarm [this challenge is TBD if available]

5 pt: Not Invented Here: Use a custom PCB on your final robot as part of another challenge (not only visual purposes).

SCORING – CHALLENGE DAY

The scoring on challenge day is based on the value of the loot on the map. This is **only** for the challenge day itself, and is counted as 5% of your grade.

- **Bronze: 5 pts base**
- **Silver: 20 pts base**
- **Gold: 100 pts base**

Your final score is based on your interaction with this loot. Note that retrieving the high-value loot will require you to interact with the course itself by e.g., unlocking the safe or similar challenges.

There is a multiplier for what you do with the loot:

- Loot moved at all (0.25x value) - e.g., even if just hit around. Must be fully moved from its original placement.
- Loot collected (1x value) - must be on robot at finish time to count (otherwise counts as 0.25x value)
- Loot returned to finish zone (2x value for any touching finish area, counts if your robot returns with loot onboard)
- For the "Indiana Jones Sensor" you *CANNOT* trigger the alarm/sensor. The loot base value becomes 0 pts if you trigger the sensor removing the loot.

The score is equal to the (loot value) x (multiplier) .

The maximum score of this "challenge day" results will determine 1st/2nd/3rd placements for awards.

For marking, the challenge day will be marked out of a score of 200 points (again, after the multiplier is applied). If you get 200 points or more after the multiplier you will receive 100% (it's possible to get more than 700 points). If you receive less than 200 points your score for the challenge day (5% of total mark) will be based on a score out of 200.

PEANLTY – CHALLENGE DAY

The following are disallowed by the rules, but for the continuity of the competition you can instead talk a fixed penalty:

Starting WITHOUT removing the box, but using a command. The robot must still fit within the box size. -25 pts

The robot also does not fit within the box size. -75 pts

The robot moves a course object (such as I.N.D.I.N.A. sensor or cage): -50 pts . Any moved objectives are "dead". If you move the cage for example you cannot collect the loot under it.

Additional penalties may be added at the judge's discretion. Once a penalty is added it will be applied to all previous (and future) competition runs.