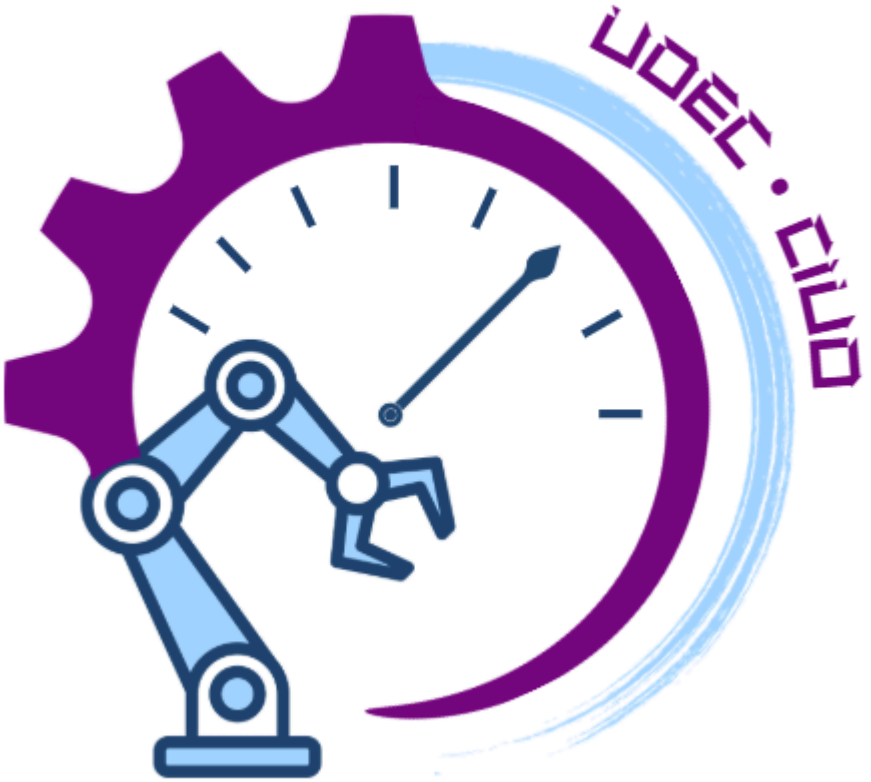


university of OTTAWA

ENGINEERING COMPETITION

Junior Design Competition 2026

uOttawa Engineering Students' Society

VP Internal

competition@uottawaess.ca

This document outlines requirements and expectations for competitors in the Junior Design category at uOEC 2026. Please read this document carefully and in full.

Overview

This competition is strictly for engineering students in their first and second years of study. Junior engineering students are challenged to apply hands-on problem-solving and rapid-prototyping to solve a technical problem. The Junior Design category doesn't focus on theoretical analysis, but prioritizes prototype performance and build quality under time and resource constraints.

Scenario

Following a severe ice storm, the City of Ottawa requires rapidly deployable emergency shelters to provide temporary housing for displaced residents.

Objective

Your team has been hired as the structural engineering consultant to design and construct a modular housing prototype that can be quickly assembled, expanded as demand increases, and safely support structural loading. To enable flexible deployment, your design must feature a structural system made up of four identical, individual housing modules that assemble into one unified shelter structure.

The objective is to demonstrate an efficient structural system that balances structural performance, ease of assembly, expandability, and cost efficiency, since these are what the tests actually measure.

Rules and constraints

The maximum number of individuals for a Junior Design team is four (4).
Time Limit

- 120 minutes (from the moment materials are distributed)

Your structure must:

- Consist of at least four (4) identical structural modules. The identical modules must share the exact same geometry, dimensions (height, width, and depth) and amount of materials
- Each module must be capable of standing independently before assembly and meet these size constraints before assembly: minimum height 150mm, with 100mm x 100mm minimum and 200mm x 200mm maximum footprint
- The complete structure includes one entrance opening at least 100mm high by 50mm wide, and no more than 200mm high.
- The assembled structure must be at least 190 mm tall, measured from the top surface of the testing base to the highest point of the roof
- The structure must stand freely on the provided testing base (200mm x 200mm cardboard resting flat on the table). No adhesive, tape, or pins may connect directly to the base or surrounding surface

- A standardized roof platform (300mm x 300mm cardboard ~ 150g) will be given to every team. Your structure must support this roof flat across its top, serving as a weight placement during Test 2

Your team is tasked with designing a Modular Emergency House. The physical prototype will be evaluated on:

1. Technical Feasibility & Creativity
    - Clear communication of structural choices and design logic to judges
    - Aesthetic alignment with emergency house needs
2. Structure pre-test check up
3. Rapid Assemble (Test 1)
4. Structural Loading Capacity & Efficiency (Test 2)
5. Surprise Challenge (Test 3)

Durations

- The time to build your prototypes is 120 minutes, from 8:00 - 10:00
- The judging time for this competition is from 10:00 am - 12:00 pm, including presentation and testing time.
    - Each team presentation duration: five (5) minutes.
    - Each team question period duration: two (2) minutes.
    - Teams will be split across three judging stations for presentations and testing.

Testing

Your prototype must complete these tests, detailed below:

Pre-test check-up:
Each module must be capable of standing independently before assembly. All teams must line up their modules, side-by-side on the flat surface of the table. Modules must be spaced at least 50 mm apart, and cannot lean against the walls or touch anything. Once all four modules are positioned, the team must take a step back and raise their hands, and the official 5-second countdown begins.

Team members may not touch or catch a module during the 5-second countdown. Any module that is touched, adjusted, or caught by a team member after the countdown begins automatically fails the stability test.

Penalty: 1 point is deducted from the team's total final score for each module that fails (tips over, collapses, or is touched/caught), up to 4 points in total.

Test 1: Assembly (10 points)
Your team begins with all modules separated and resting flat on the table. When time begins (starts with the moment judges say "Go"), the team must assemble the complete structure. The timer stops the instant all team members completely remove their hands and step back, calling out "Done". Teams are permitted to make adjustments to realign joints or repair broken connections but the timer won't stop until all hands are off and the team steps off.
Your scores are based on:

- Quality of connection (2 points): can the structure stand still for 30 seconds without external forces (leaning on walls, hands, etc.)
    - 2 points: structure stands completely unassisted for the full 30 seconds without collapsing
    - 1 points: structure stands for 30 seconds, but one or more connecting members visibly loosen, detach, or sag during the hold
    - 0 points: the structure tips over, collapses or loses a module within the 30-second window

- Assemble time (8 points): how fast can your team assemble the structure?

Assemble time of structure (t)	Points
$t < 45$ seconds	8 points
45 seconds $\leq t <$ 60 seconds	7 points
1 minute $\leq t <$ 1 minute 30 seconds	5 points
1 minute 30 seconds $\leq t <$ 2 minutes	4 points
2 minutes $\leq t <$ 3 minutes	3 points
3 minutes $\leq t \leq$ 5 minutes	1 points
>5 minutes	0 points

Test 2: Load Test (15 points)
A loading platform will be placed on the roof of the structure, and weights will be gradually placed until the maximum amount of weight (10 kg). Your scores are based on:

- Maximum load supported (10 points):

Testing begins with an initial load 4kg for 20 seconds, judges add a 1-kg weight every 10 seconds directly centered on the platform until:

- The structure reach maximum test cap
- The structure tips over, collapses or loses a module at any point during loading.

To successfully earn the point, the structure must hold the corresponding weight for full 10 seconds without failing before the next weight is applied

Maximum weights on structure (kg)	Points
4 kg	4 points
5 kg	5 points
6 kg	6 points

7 kg	7 points
8 kg	8 points
9 kg	9 points
10 kg	10 points

- Structural efficiency (5 points):

Since all teams are given the same amount of materials, efficiency tests are used to measure strength to weight ratio. Before Test 2 begins, judges weigh the complete structure (with the roof) using a digital scale to find the total mass of the structure (in kg).

Efficiency Ratio (E) = (Maximum loads supported (in kg) / total mass of structure (in kg))

The team with the highest Efficiency Ratio (E max) in the competition receives 5.00 points. All other teams receive points scaled proportionally relative to the best team. The score (round up to 2 decimal place) will be calculated using this formula:

Efficiency Score = 5 x (E team / E max)

Test 3: Surprise Challenge (5 points)
The city has doubled the housing demand. Add one new housing module to your structure using given materials. You have 10 minutes to expand the building without rebuilding the whole structure.

All teams must integrate one additional housing module into their existing assembled shelter structure from Test 1/Test 2. Teams do not use leftover materials from previous rounds.
Teams are strictly prohibited from dismantling or rebuilding the core structures assembled in Test 1.
All modifications must be made by attaching the new module onto or alongside the standing structure.
The official 10-minute timer starts immediately upon the distribution of the Expansion Material and the judge's "Go" command.

Your scores are based on:

- Quality of Connection (2 points): Similar to Test 1, see above.
- Execution Speed (3 points): Team will pass with 3 points if they can attach the 5th identical module to the structure. Any team that exceeds the 10-minutes mark, or fails to attach the 5th module will count as a failure and get 0 point.

Material List

Table 1. Construction Material

Item	Limit per Team
Popsicle sticks	50
Bamboo skewers	20
Cardstocks	2
Hot melt glue stick	10
Binder clips	8

Rubber band	10

Table 2. Construction Tools

Tools	Number Available
Laptops	1 (bring your own)
Exacto Knives	1
Ruler	1
Hot glue gun	1
Scissors	2

- The size of your Construction Material are all standards and every team gets the same amount of material, as well as the same tools.
- The exacto knife is a safety-sensitive tool, the team using it must follow the competition safety rule. A volunteer or committee member must be there to supervise it.

Table 3. Surprise Challenge Material

Materials	Number Available
Popsicle sticks	10
Hot melt glue sticks	2

Deliverable

No reports or presentation materials are required in the Junior Team Design competition. Teams may use visual aids in their presentations if they so desire, however, emphasis should be placed on a clear explanation of the design and the functionality of the prototype. This is reflected in the judging criteria. Your presentation should address the following:

- Scalability: How effective was the design and design process given the provide scenario
- Design Process: Initial brainstorms, sketching of prototype, and prototyping iteration
- Design Justification: why specific geometry, joints, and selection of materials
- Design Critique: Structural weakness, potential failure and how to improve
- Results of each test should be discussed

Competitors have five (5) minutes to present their designs. All team members must be present and participate in the presentation. The original design, its rationale, a description of the design process, and a critique of the prototype are required presentation components. The judges then have a maximum of two (2) minutes to ask questions. The prototype will be available during the presentation.

Judging and Scoring

For your reference, the judging matrix is provided below.

Design Quality	Deliverable Compliance with Expectations	/ 5
	Technical Scalability/Innovation	/ 5
	Design Process	/ 15
	Design Justification	/ 15
	Design Critique	/ 10
Presentation	Voice	/ 5
	Articulation and Timing	/ 5
	Visual Aids	/ 5
	Response to Questions	/ 5
Testing	Pre-test	/ -4
	Test 1	/ 10
	Test 2	/ 15
	Test 3	/ 5
	(Details above)	
Penalties	Plagiarism	-50
	Insufficient Citation	-50
	Absent Team Member	-25
Total		/ 100

Refer to the uOEC 2026 rulebook for general rules. Where this package and the rulebook differ, this package takes precedence.