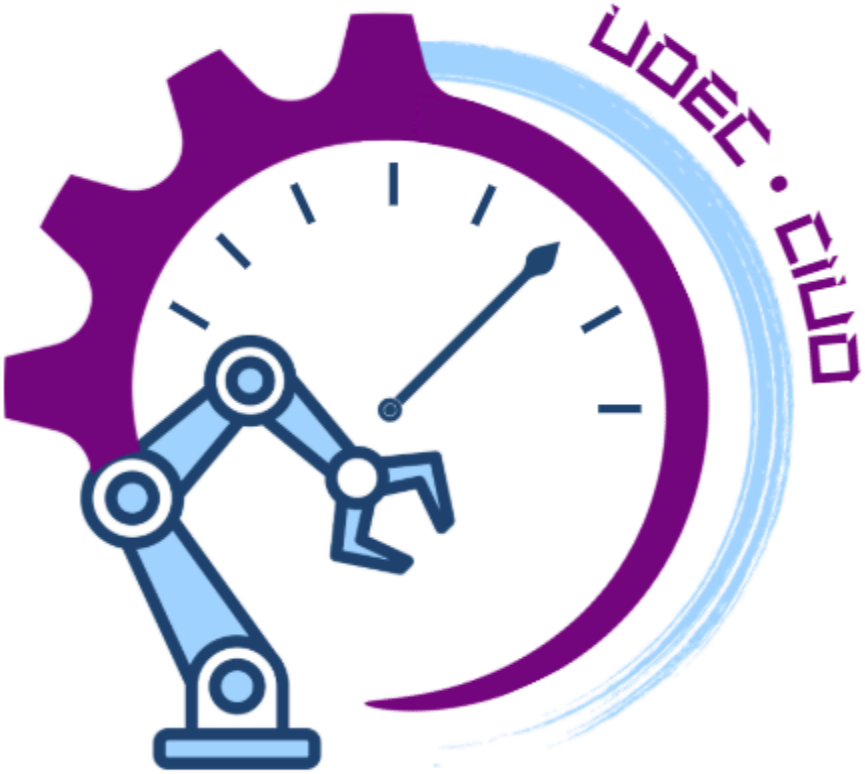


university of OTTAWA

ENGINEERING COMPETITION

Innovative Design Competition 2026

uOttawa Engineering Students' Society

VP Internal

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

Overview

The Innovative Design category challenges engineering students to apply multi-disciplinary system integration, practical design methodologies, and economic analysis to solve a real-world engineering challenge.

In this competition, teams produce a comprehensive technical design proposal for a low-cost, wearable health-monitoring device. Rather than building a physical prototype on-site, success relies on technical rigour, system feasibility, low-power hardware design, cost management, and a clear presentation tailored to senior engineering executives with a mixed technical and strategic background.

A team consists of a maximum of six (6) members.

Scenario

During long-duration temporal jump missions, crew members face severe physiological stress. While metabolic friction from time-dilation provides narrative context for the scenario, teams must specifically engineer solutions for the real-world physiological and environmental factors: sudden atmospheric pressure drops, elevated ambient radiation, and vital physiological metrics. Standard hospital diagnostic equipment is far too bulky, power-hungry, and fragile for active field surveys across unpredictable target environments.

To protect field personnel, your engineering firm has been contracted to design an ultra-compact, rugged, wearable health-monitoring band. The device must continuously monitor vital health metrics, detect the environmental hazards specified in the Performance Requirements, and alert the wearer to physiological danger all while operating on extremely low power. Design efficiency and manufacturability will be formally evaluated according to the competition judging criteria.

Objective

Design a detailed conceptual hardware, electrical, and firmware system architecture for the Compact Temporal Health & Vitals Monitor. Rather than building a physical prototype, teams are expected to deliver production-ready engineering documentation, including complete schematic-level component selections, block diagrams, power budgets, and firmware logic flowcharts.

Your design must integrate specific, commercially available non-invasive biometric sensors (or COTS equivalent components), real-time environmental condition monitoring, an intuitive local user alert system, and an efficient power distribution subsystem. Operational reliability must be formally validated

through a Failure Modes and Effects Analysis (FMEA) and by proving the system maintains continuous operation over the mandatory 72-hour operating requirement.

Your team will submit a 1-page Technical Design Summary and deliver a 10-minute live design pitch (followed by 5 minutes of Judge Q&A) to a panel of engineering executives. Audio/visual setup time is managed separately and will not count against your 10-minute pitch window. Your proposal must prove technical feasibility, material cost efficiency, and operational reliability under strict resource limits.

Rules and Constraints

Performance Requirements & System Constraints

To ensure safety, fair judging, and operational reliability while allowing maximum design freedom, proposals must meet or exceed the following baseline performance requirements:

Required Vital Signs

- **Heart Rate & Blood Oxygen**: Teams must measure both Heart Rate (HR, in BPM) and Blood Oxygen Saturation (SpO_2 in %).
- **Body Temperature**: Teams must measure skin surface temperature. Measuring or estimating core body temperature from skin readings is optional.
- **Metabolic Stress**: Teams must use Galvanic Skin Response (GSR) / Electrodermal Activity (EDA) as the primary required hardware measurement for metabolic stress. Alternative or supplementary biometric metrics may be proposed alongside GSR.

Required Environmental Hazards

- **Ambient Barometric Pressure**: Rapid pressure drop detection for atmospheric integrity monitoring.
- **Radiation Levels**: Teams must detect ionizing radiation (e.g., gamma/X-ray dose rate). Measuring non-ionizing electromagnetic radiation (EMF) is optional.

Optional Measurements (Innovation Room)

- Hydration level monitoring, motion/fall detection (IMU), ambient toxic gas sensing, or time-dilation metabolic drift estimation.
- *Scoring Clarification:* These optional metrics serve as bonus innovation opportunities evaluated directly within the "Innovation & System Integration" criteria on the judging rubric.

Power Architecture & 72-Hour Operating Profile

- **Verification Method**: Because no physical hardware is built on-site, compliance with the 72-hour operating requirement must be demonstrated through a comprehensive Calculated Power Budget (excel sheet or tabular breakdown submitted in the proposal).
- **Duty Cycles & Sleep Modes**: The system is permitted to enter dynamic low-power/sleep modes during the 72 hours.
- **Definition of Continuous Active Monitoring**:
    - "Continuous active monitoring" does not require high-frequency continuous sampling on all sensors 100% of the time.
    - Teams must define and justify their sensor duty cycles, processor sleep states, alert polling rates, and wireless transmission windows in their power budget, proving the device reliably tracks vitals and detects hazard thresholds over 72 hours without external power access.

Deliverables

Formatting Requirements:

- Maximum length: Exactly one (1) page.
- Font: 12-point font (standard serif or sans-serif).
- Line Spacing: 1.5 line spacing.
- Margins: 1 inch (2.54 cm) on all sides.

Required Content: Must state team alias, competitor name(s), design topic, system architecture overview, and summary of engineering feasibility/economic considerations.

Live Presentation

- Design**:** 8:30 am to 3:15 pm, paused from 12:00 pm to 1:00 pm for lunch.
- One-page Technical Design Summary and presentation due at 3:15 pm.
- Presentations: from 3:15 pm.
- Presentation Duration: 10 minutes.
- Question Period Duration: 5 minutes.
- Audio/visual setup occurs during this dedicated 3-minute window and does not subtract from your 10-minute presentation time.
- Time penalty policy :
    - Timers start as soon as the presentation begins.
    - Going over the 10-minute presentation limit will trigger a formal point penalty, regardless of whether the total room setup or Q&A finishes ahead of schedule.

Judging Rubric and penalties

For your reference, the judging matrix is provided below.

Project		/70
	Design Justification (Problem Definition,Architectural choice trade-offs)	/30
	Environmental,Social,&Economic Feasibility (Cost management, Manufacturability, safety and Ethics)	/20
	Technical Feasibility &Innovation (Hardware,firmware integration,low power design figure,FMEA Reliability Proof)	/20
Design summary	Clarity Writing style & Professionalism Deliverable Compliance (Formatting, Structure,Length,Adherence, to specs)	/10
Presentation	Voice & Articulation Timing & Structure Visual Aids (Diagrams,Schematics, readability) Response to Questions (Technical mastering during Judge Q&A)	/20
Penalties	Plagiarism Insufficient Citation Documents Received After Deadline Absent Team Member	-50 -50 -50 -25
Total		/ 100

Additional penalties

Presentation Timing Penalty:

- Threshold: Deductions apply immediately after exceeding the 10-minute presentation limit (starting at 10:01), regardless of overall room block timing.
- Calculation & Partial Minutes: Deducts two (2) points per minute over time. Partial minutes are rounded up to the next full minute (e.g., 10:01 to 10:59 incurs a 2-point deduction; 11:00 to 11:30 incurs a 4-point deduction).

Late Submission Penalty:

- Deducts 50 for submissions received after the designated deadline.

Grammar & Spelling Penalty:

- Deducts one (1) point for every three (3) distinct spelling or grammatical errors found in the 1-page Design Summary (e.g., 1–2 errors = 0 pts; 3–5 errors = -1 pt; 6–8 errors = -2 pts).

- *Policy Stacking Clarification:* Applied as a direct deduction against the 10-point Design Summary score (maximum total deduction capped at -3 points under this specific category).