

“CHAIN OF MECHANISMS” COMPETITION RULES & REGULATIONS

1. General Rules

1.1. The “Chain of Mechanisms” competition is a technical-creative contest for designing a sequential chain-reaction mechanism system based on engineering and physics principles.

1.2. The competition assesses participants’ mechanical thinking, systems approach, engineering solutions, and practical application of theoretical knowledge.

1.3. It is a team-based event; these rules are mandatory for all participants.

2. Concept and Objectives

2.1. Concept: Teams design a “chain reaction mechanism system” activated by a single starting trigger and operating through consecutive mechanical stages. The system must achieve a clear, observable, and verifiable outcome.

2.2. Main Objectives:

- Practical application of kinematics and mechanics laws;
- Understanding energy transfer and mechanical logic;
- Developing engineering design, prototyping, and problem-solving skills;
- Creating safe, stable, and aesthetically appealing technical systems.

3. Participants and Team Composition

3.1. Teams consist of 2 to 4 members.

3.2. Recommended (optimal) size: 3-4 participants.

3.3. Each team submits only one project.

4. Competition Stages

4.1. Registration and concept submission (1 page).

4.2. Prototype testing (local stage).

4.3. Final stage:

- On-site assembly and tuning of the device;
- System activation;
- 3-5 minute technical and conceptual pitch/presentation.

5. Minimum Technical Requirements

5.1. Activation: The system must be triggered by exactly one action (button, string pull, ball drop, sensor, etc.).

5.2. Sequence: At least 8-12 independent mechanical stages (each transferring energy to the next).

5.3. Physical Logic: Each stage must directly initiate the next via physical interaction and incorporate at least 4 different physical principles (impact, rotation, tension/pull, sliding, gravity, etc.).

5.4. Final Outcome: The system must reliably achieve one of the following:

- Light bulb or LED turns on;

- Buzzer sounds;
- Flag is raised;
- Finish button is pressed or equivalent clear action.

5.5. Time Limit: From trigger to completion – 50-120 seconds.

6. Dimensions and Testing Conditions

6.1. Maximum dimensions: base area 2 m×2 m, height 1.5×1.8 m.

6.2. In the final, each team is allowed 3 restarts.

6.3. Failure after 3 attempts results in disqualification.

7. Permitted and Prohibited Components

7.1. Mechanical elements (must be metal-based): lever, gear, pulley, hinge, spring, weight, ramp/inclined plane, rope, magnet, wheel, jack, valve, and other metal parts.

7.2. Electronics (optional, low-voltage): 5-12 V systems, Arduino/ESP, relay, limit switch, IR sensor.

7.3. Mandatory requirements:

- Core mechanical parts must be made of metal;
- 3D printing is permitted;
- Ready-made construction kits (LEGO, etc.) are strictly prohibited.

8. Safety Requirements

8.1. Strictly prohibited:

- Open flame, explosives, pyrotechnics;
- Direct use of 220 V power;
- Mechanisms that could harm human health;
- Chemically aggressive substances and flammable liquids.

8.2. The device must be protected from external influences, stable, and ergonomic.

9. Submitted Documents

9.1. A3 poster (system block diagram and stage flowchart).

9.2. Technical passport (1-2 pages):

- Trigger description;
- Detailed list of stages (with physical principle indicated);
- Final outcome;
- Materials used;
- Safety measures.

9.3. 30-60 second demo video (device in operation).

10. Final Testing Protocol

10.1. Teams are given 5-10 minutes to prepare the device for start.

10.2. Judges verify the trigger condition and safety.

10.3. The system is activated by one participant using a single trigger.

11. Evaluation Criteria (total 100 points)

- Reliability and repeatability - 25 points
- Engineering complexity and technical solutions -20 points
- Physics-based design and principle diversity -15 points
- Innovation, creativity, and original ideas -15 points
- Precision and cleanliness of the final outcome -10 points
- Quality of presentation, documentation, and pitch -10 points
- Safety, aesthetics, and build quality -5 points

Bonus Nominations:

- Best Creative Mechanism
- Best Kinematic Solution

These rules may be amended at least 30 days prior to the competition start. The updated version will be provided to all registered teams.