
2025

Engineering Design Project (EDP) Competition

Catapult

GENERAL INFORMATION:

The goal of this competition is to give students the opportunity to investigate the art, science, and therefore limitless possibilities of system design. The main objective of this project is to construct a robotic arm that can throw balls of various weights toward a target at a distance of 3 meters in the shortest amount of time, after facing obstacles that are there to increase the level of challenge.

Participation is especially welcomed by engineering students in their first and second years of study. They can have fun while showcasing their uniqueness and inventiveness.

Three judges, who will be selected by the IEEE UAE Students Day steering committee, will assess the entries to the competition. For further assessment, the regulations for the competition are shown below.

COMPETITION RULES:

- 1. Undergraduate engineering students within the UAE are eligible for this competition.**
- 2. Each institution can submit a maximum of two teams for judging in this competition. Each competition team should have no more than four students.**
- 3. The system will be tested indoors using two different weights ((1st is 2 kg and 2nd is 4kg)) to determine its efficiency.**
- 4. The system will have a maximum of a 2-meter height, 2-meter-wide, and 2-meter depth.**
- 5. The system should be completely manual, and no further programming should be used. Teams with electronic components are not permissible and will be disqualified. Any liquid is not allowed.**
- 6. All material used in the systems must be safe, harmless, and accessible to everyone in the standard market. Systems should need no safety protection.**
- 7. The Design MUST look like a Catapult and not just a shooting mechanism.**

8. Each Round will be based on;

Rounds	Description	Points
Round 1 3 meters away 2 shots (1 st is 2 kg and 2 nd is 4kg)	Each round has two tries, with different weights	/30
Round 2 5 meters 2 shots (1 st is 2 kg and 2 nd is 4kg)	Each round has two tries, with different weights	/30
Round 3 7 meters away 2 shots (1 st is 2 kg and 2 nd is 4kg)	Each round has two tries, with different weights	/30
3D Printing and innovation		/10

9. If the team fails to attempt at one round, they can continue to compete for all three rounds.
10. Ready-made catapults are not allowed; students MUST design/cut their catapult. In 3D printing utilization, students must demonstrate and provide evidence of the design steps. (Judges have the right to disqualify TEAMS with a ready-made system).
11. In addition to the competition round, each team will be given 5 minutes to demonstrate all aspects of their system.

Description

Objective:

Build a spring-loaded catapult capable of shooting weights to hit a target divided into scoring zones. The catapult's position and weight can be adjusted, and players aim to achieve the highest score over three rounds.

Project Breakdown and Details

1. Catapult Design Specifications

Dimensions:

- Height: 2 meters – This gives the catapult a significant launching elevation to help achieve distance and height with each shot.
- Width: 2 meters – The wide base provides stability to prevent tipping when launching heavier weights or shooting at farther distances.

Mobility and Positioning:

- The catapult must be equipped with four wheels to allow for easy repositioning.
- Three Adjustable Shooting Distances: 2 meters, 3 meters, and 7 meters from the target.
- Each distance requires different levels of force to reach the target accurately.
- The adjustable positions add a strategic element, as the player must account for how distance impacts ball trajectory and required spring tension.

Launch Mechanism:

- Spring-Powered System or similar mechanisms – The catapult uses a spring to provide the force needed to launch the ball. The player can adjust the tension in the spring, which affects the power and distance of the launch.
- Weight Selection: The system will be tested using two different weights
- 2 kg – A lighter ball that might travel farther with less spring force.
- 4 kg – A heavier ball that may require more force but could have a more stable trajectory.

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2. Target and Scoring Zones

Target Structure:

- Shape and Size: The target is a large circular area with a 6-meter radius. This large target accommodates different scoring zones and allows for a range of scores depending on where the ball lands.

- Three Scoring Zones: The target is divided into three concentric rings, each with a different scoring value based on proximity to the center.

Scoring Zones:

- Zone 1 (Center):

- Radius: 0.5 Meter

- Points: 15 points – This is the highest scoring zone, rewarding players who can aim precisely to hit the center.

- Zone 2 (Middle Ring):

- Radius: 1.5 Meter

- Points: 10 points – A moderately high score for shots that land near the center but not quite within Zone 1.

- Zone 3 (Outer Ring):

- Radius: 2.5 meter

- Points: 5 points – The lowest score within the target area, providing points for less accurate shots that still hit within the target boundary.

Special Scoring Condition:

- If the ball lands exactly on the border between two zones - Border Rule: The score will be the average of the two adjacent zones' points.

- For example:

Zones 1 and 2: Score = $(15 + 10) / 2 = 12.5$ points.

Zones 2 and 3: Score = $(10 + 5) / 2 = 7.5$ points.

- This rule incentivizes accuracy, as border shots reward partial points but less than a fully centered hit.

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Illustrations for catapult and scoring zones



