



Lahore Grammar School
Johar Town Senior Boys Campus

PROJECT X

STUDY GUIDE



12 · 13 · 14
SEPTEMBER

Introduction:

This year's Project X has been separated into two separate subcategories, each of which aims to emphasize a different aspect of robotics. The first, called Challenger, is centered on pure robotics and offers a controlled setting to impartially assess competitors' technical proficiency and engineering accuracy. In contrast, the second stream, called Thinker, focuses on Bluetooth control and its practical uses, giving learners a more hands-on and application-focused approach to robotics exploration. When combined, these categories provide a thorough platform that strikes a balance between innovative practicality and technical rigor.

Challenger (Sub-category 1)

Round 1:

Delegate Count: 3

Duration: 4 hours

In the first round, delegates will brainstorm and develop a project to address a specific issue, which will then be evaluated by a panel of judges. The highest-scoring teams will qualify for the next round. Teams will have 1 hour on the event day to set up their presentations. Tables will be provided for displaying robots, and participants may also use standees, posters, and flyers.

The theme for this year is to design and construct a functional robot that can help prevent, reduce, or alleviate the impact of natural disasters such as earthquakes, floods, hurricanes, or wildfires. The goal is to safeguard lives, minimise damage, and support recovery efforts. Robots must not use harmful substances such as petrol or oil, must operate on a power supply not exceeding 35 volts, and be fully functional without being connected to a power outlet. They must also be safe to operate, posing no danger to surrounding personnel.

Note: The project needs to be prepared **before** the event. This is an elimination round.

Round 2:

Delegate Count: 2

Duration: 3 hours

This round will be a practical test designed to assess the technical skills of participating teams. The highest-scoring teams will advance to the next round. Delegates will complete a series of tasks related to circuits and electronics, ranging from basic circuit assembly to more complex configurations.

They are expected to be familiar with the following components: Arduinos, ZK5AD, L298N, and L293D motor drivers, PNP and NPN transistors, inductors, capacitors, resistors, LEDs, voltage regulators and diodes. Each task must be completed within the allotted time and will be evaluated by the judges for accuracy, functionality, and adherence to safety standards. The combined score across all tasks will determine the team's final ranking for this round.

Note: This is an elimination round.

Round 3:

Delegate Count: 3

Duration: 5 hours

In this Minecraft-themed round, participants will build a colour-sensing servo arm to sort minecarts on rails into the correct tracks based on the minerals they carry. Each mineral will be identified by its colour, and the servo arm must detect this colour and direct the minecart accordingly.

This task will test skills in mechanical assembly, programming, and sensor integration, with scoring focused on accuracy, speed, and smooth operation. Participants will be provided with a PCA9685 module to control the servo arm's movements.

Note: Final decisions as well as potential changes are in the hands of category heads.

Tinkerer (Sub-category 2)

Round 1:

Delegate Count: No fixed cap

Duration: 3 hours

In this round, delegates design wirelessly controlled sumo robots with the sole objective of pushing an opposing robot out of the arena without using any weapons. The sumo arena will be made of laminated lasani wood. Delegates must build their robots according to the following restrictions: Robots can be remote controlled or preprogrammed, made of any material, and contain any type of processor, electronics, sensors, or batteries. They must fit within a 30×30×30 cm cube, weigh no more than 5 kg, and must not emit smoke, fire, liquids, powder, or projectiles. Electrical or magnetic interference is not allowed.

Sumo robots must be harmless to both humans and other robots, serving only to push the opponent out of the arena. Matches will be played in a best-of-three format. Each round lasts 3 minutes. The first robot to touch outside the ring loses the round, even if the other robot goes out immediately after. If both robots exit at the same time, the round is declared a draw and restarted.

Note: The sumo bot needs to be built **before** the event. This is an elimination round. The judges' decisions are final in all matters related to the match outcome and the compliance of the sumo robot's design with the competition rules.

Round 2:

Delegate Count: 3

Duration: 4 hours

Delegates will design and build a Bluetooth-controlled robot with a specialised servo armature to compete in a football-inspired game. Matches will follow a tournament format, testing both engineering and strategy. The arena design will be revealed on the day of the event. Teams will be provided with components for a 4WD chassis and a single servo armature. Delegates are encouraged to be familiar with voltage regulators, the ZK5AD motor driver, and the HC-05 Bluetooth module before competing.

Note: This is an elimination round.

Round 3:

Delegate Count: 3

Duration: 4 hours

In the final round, delegates will navigate an obstacle course and complete various tasks using a Bluetooth-controlled car. Teams will have 2.5 hours to design their car for the challenges presented, such as attaching a servo arm to pick up objects from one location and drop them at another. The teams that complete the most tasks in the shortest time will advance.

Note: Final decisions as well as potential changes are in the hands of category heads.

