RAILWAYGATE AUTOMATION SYSTEM

Course Code: BECE204L

Slot:B2+TB2

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Introduction to Automatic Railway Gate Control

The Automatic Railway Gate Control project is a practical and innovative application of microcontroller technology designed to enhance safety and efficiency at railway crossings. By automating the operation of railway gates, the system eliminates the need for manual intervention and significantly reduces the risk of accidents caused by human error. It ensures timely and accurate gate operation through real-time train detection using ultrasonic sensors and microcontroller-based control. Additionally, the system incorporates visual and auditory alerts to further enhance safety for pedestrians and vehicles.

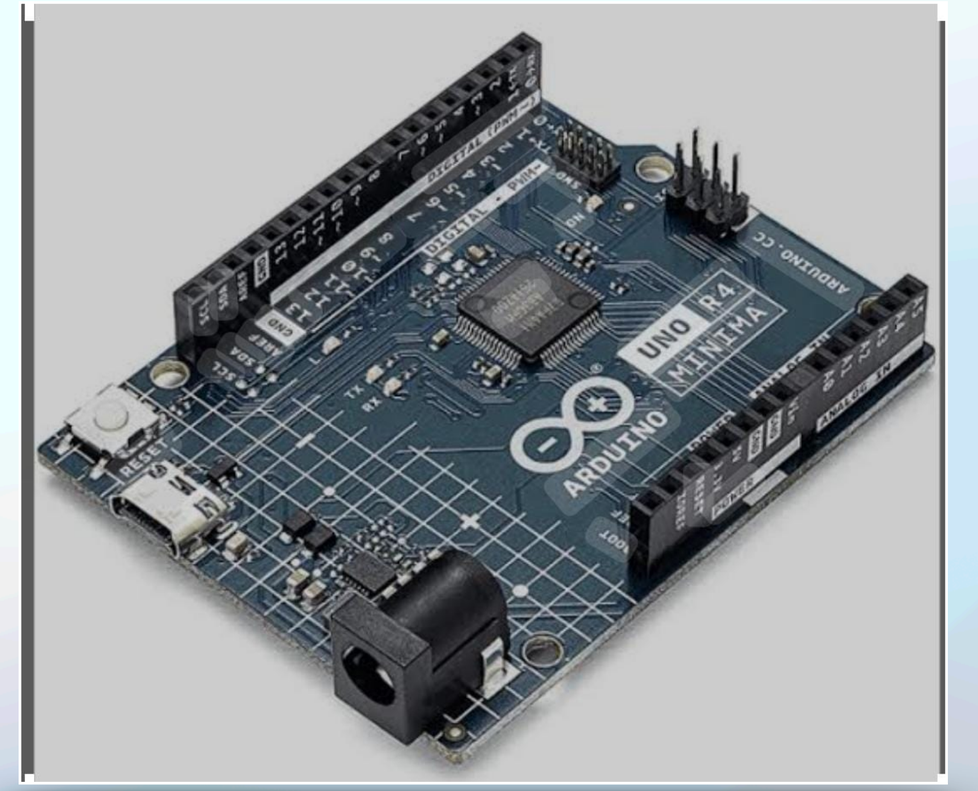
Components Required:

- Arduino Uno – Microcontroller
- Ultrasonic Sensors (HC-SR04) – Detect train arrival/departure
- Servo Motor(SG90) – Controls gate movement
- LEDs (Red & Green) – Signal indicators
- Buzzer – Alerts pedestrians
- Resistors & Connecting Wires
- Power Supply (5V or 9V Battery/Adapter)

How an Arduino Board Works?

An Arduino board works as a microcontroller-based platform that processes inputs, executes programmed instructions, and controls outputs. It functions as a bridge between hardware and software, allowing users to interact with physical components like sensors, motors, LEDs, and displays.

- Uses the Arduino IDE to write and upload programs.
- Code is written in C/C++ and uploaded via USB (Mini USB Port).
- The microcontroller stores and runs the program automatically when powered.



How Sensors Are Used in Automatic Railway Gate Control?

- Ultrasonic sensors in automatic railway gate control detect approaching trains by emitting high-frequency sound waves and measuring the time it takes for the waves to bounce back. When a train enters the detection range, the reflection pattern changes, sending a signal to a microcontroller , which triggers the gate to close while warning lights(red LED) and alarms activate for safety.

- As the train passes, another set of sensors detects its exit. After a short delay to ensure complete clearance, the system reopens the gate and turns off the signals.

Safety devices

Component	Function
Servo Motor	Moves the railway gate (Opens/Closes)
Red LED	Turns ON when the gate is closed (Train arriving)
Green LED	Turns ON when the gate is open (Train passed)
Buzzer	Beeps as a warning when the train is arriving

Working Principle:

Train Detection

• Ultrasonic sensors are placed on both sides of the railway track.

• When a train approaches, the first sensor detects it and triggers the gate closure process.

Gate Closing Mechanism:

• The Arduino receives the sensor signal and commands the servo motor to lower the gate.

• A red LED turns ON, and the buzzer starts beeping as a warning.

Train Passes & Gate Reopening:

• Once the train crosses the second sensor, it signals the Arduino that the track is clear.

• The servo motor lifts the gate back to its open position.

• A green LED turns ON, and the buzzer stops.

Thank You!!