**PRACTICAL –5**

**Aim: - Arduino programming with IR and Ultrasonic Sensor**

**Conclusion**

This practical session further expanded the skillset of participants in Arduino programming by introducing them to infrared (IR) sensors and ultrasonic sensors. Through a series of experiments, participants learned to interact with these sensors, acquire data, and integrate sensor readings into control functionalities.

The session began with exploring IR technology for remote control applications. Participants interfaced an IR sensor module with the Arduino board. They then wrote code to decode signals transmitted from a standard IR remote control. Based on the decoded signal, the code controlled an RGB LED, potentially changing its color or brightness. This exercise provided hands-on experience with IR signal reception, decoding protocols, and using sensor data to control actuators like LEDs.

The subsequent experiment shifted focus to ultrasonic sensors, commonly used for non-contact distance measurement. Participants connected an ultrasonic sensor module to the Arduino board. They then wrote code to trigger the sensor's ultrasonic pulse emission and subsequently capture the reflected pulse. The time difference between these pulses is proportional to the distance of the obstacle in front of the sensor. The code then calculated the distance and displayed it on the serial monitor for visualization. This exercise introduced participants to the principles of ultrasonic distance measurement, time-based calculations, and data presentation using the serial monitor.

The final experiment combined ultrasonic sensing with LED control, creating a practical application. Participants modified the previous code to incorporate a threshold distance (e.g., 100 cm). If the measured obstacle distance fell below this threshold, indicating an object approaching within close proximity, the code activated the LED. This exercise solidified understanding of conditional statements (if-else) and their role in implementing decision-making logic within the code.

By successfully completing these experiments, participants gained valuable experience in working with IR and ultrasonic sensors. They learned to utilize these sensors for various purposes, including remote control, distance measurement, and proximity detection. Additionally, they further honed their ability to integrate sensor data with actuator control and decision-making logic within their Arduino programs. These skills form a strong foundation for developing more advanced Internet of Things (IoT) applications that interact with their surrounding environment and respond to external stimuli.