LAB REPORT 7:
REMOTE TEMPERATURE MONITORING AND CONTROL

GROUP 5

MCTA 3203

SEMESTER 1 2024/2025

MECHATRONICS SYSTEM INTEGRATION

DATE OF SUBMISSION: NOVEMBER 2024

NO	NAME	MATRIC NUMBER
1.	MUHAMMAD AFIQ ADHAM BIN MOHD NADZRI	2227531
2.	MUHAMMAD AMIN BIN MOHAMAD RIZAL	2217535
3.	MUHAMMAD AFIQ BIN MOHD ASRI	2212541
4.	MUHAMMAD AKMAL BIN MOHD FAUZI	2214077
5.	MUHAMMAD AFIQ IKHWAN BIN NOR SHAHRIZAL	2215897

TABLE OF CONTENTS

INTRODUCTION

In this lab, we explore the integration of Bluetooth and Wi-Fi data interfacing within a mechatronics system. The primary focus is on the development of a wireless temperature monitoring and control system using Arduino, Wi-Fi connectivity, and a temperature sensor. This setup not only allows real-time data acquisition but also enables remote monitoring and control through a smartphone application or cloud-based services like ThingSpeak. By combining these technologies, the system provides insights into the environmental conditions and enables corrective actions based on data-driven decisions.

The experiment highlights the importance of seamless communication between microcontrollers and peripheral devices in modern automation systems. Such systems find applications in smart home environments, industrial automation, and IoT (Internet of Things) ecosystems, showcasing the interplay of sensors, actuators, and data communication technologies. This report discusses the hardware setup, software design, and practical challenges encountered during the integration process.

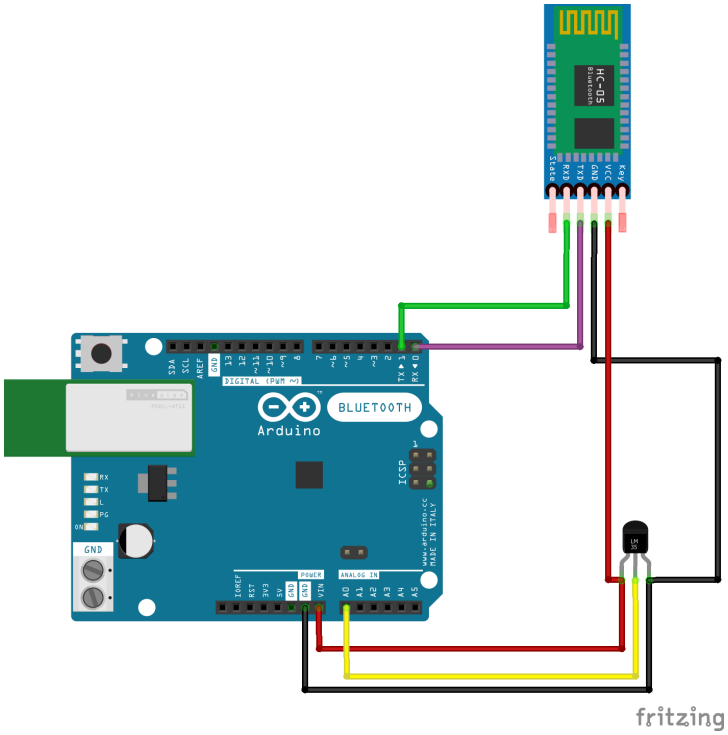
ABSTRACT

This lab report details the implementation of a wireless temperature monitoring system leveraging an Arduino microcontroller, a Bluetooth module, and a Wi-Fi network. The temperature data, acquired using a thermistor, is transmitted via Wi-Fi to a cloud platform for visualization and analysis. A smartphone application communicates with the system via Bluetooth to enable remote control of connected devices, such as a fan or heater, based on the temperature readings. This experiment demonstrates the integration of hardware and software components for seamless data processing and control in a networked environment.

MATERIALS AND EQUIPMENT:

1. Arduino board with Wi-Fi capability
2. Temperature sensor
3. Bluetooth module
4. Smartphone with Bluetooth support
5. Wi-Fi network and internet access
6. Power supply for the Arduino
7. Breadboard and jumper wires

EXPERIMENTAL SETUP



DISCUSSION

In this lab, we successfully implemented a wireless temperature monitoring and control system utilizing an Arduino microcontroller, Wi-Fi, and Bluetooth technologies. The experiment involved interfacing a temperature sensor with the Arduino to measure real-time temperature data, which was then transmitted via Wi-Fi to the ThingSpeak platform for visualization and remote monitoring. This experiment illustrated the practical integration of hardware and software components in creating an IoT-based system. The seamless flow of data from the sensor to the cloud and the ability to remotely interact with the system demonstrated the potential of modern technologies for automation and monitoring. The process also required careful configuration of hardware connections, accurate programming of Arduino sketches, and synchronization between Wi-Fi and Bluetooth communication protocols.

During the experiment, several challenges were encountered that required careful consideration and troubleshooting. Maintaining stable Wi-Fi and Bluetooth connections proved difficult due to potential interference or weak signals, which could disrupt communication and delay data transmission. The accuracy of temperature readings depended heavily on the sensor's calibration and external environmental factors, which could introduce variability. Power management was another critical issue, as the Arduino and connected modules are power-intensive, and insufficient power supply could cause instability or failure. Writing and debugging Arduino code to handle both Wi-Fi and Bluetooth protocols simultaneously was complex, with errors potentially leading to system crashes or incorrect data transmission. Additionally, ensuring real-time data synchronization between the Arduino, cloud platform, and smartphone application was essential to avoid mismatches or delays. Finally, developing an intuitive smartphone interface for user interaction posed challenges in ensuring usability and responsiveness. These obstacles highlighted the importance of robust system design, iterative testing, and effective problem-solving in IoT projects.

CONCLUSION

This experiment successfully demonstrated the development and integration of a wireless temperature monitoring and control system using Arduino, Wi-Fi, and Bluetooth technologies. By implementing both real-time temperature monitoring via the ThingSpeak cloud platform and remote control capabilities through a Bluetooth-connected smartphone application, the system achieved its objectives of efficient data acquisition, visualization, and actuation. The integration of sensors, microcontrollers, and communication modules highlighted the practical application of mechatronic principles in creating interconnected systems for smart automation. The experiment underlined the potential of IoT-based solutions in diverse applications, including environmental monitoring, home automation, and industrial control. Overall, this project illustrates the versatility and effectiveness of combining wireless communication technologies for creating innovative and practical solutions in modern mechatronic systems.