

## ABSTRACT

*Micro, small, and medium enterprises, especially street food vendors, often face challenges in maintaining the temperature of food and beverages. Improper temperature control can affect product quality and shelf life, leading to customer dissatisfaction. This study aims to design an IoT-integrated automated temperature control system based on Peltier modules and heaters. The system is designed to maintain food and beverage temperatures in either hot or cold conditions according to user requirements and can be remotely monitored and controlled via the Blynk application. The automation system utilizes an NTC thermistor sensor to measure temperature, which is processed by an ESP32 microcontroller. When temperature <setpoint, the system activates the Peltier module to generate cold temperatures. Conversely, when temperature >setpoint, the heater is activated to produce heat. Sensor calibration results yield the equation  $y = 1.0634x - 2.719$  with a coefficient of determination  $R^2 = 0.9965$ . The average error obtained in heating mode is 3.4% with an accuracy of 96.6%, while in cooling mode the average error is 7.0% with an accuracy of 93%. The Blynk application successfully provides features for remote monitoring and control of the food box temperature.*

**Keywords :** *food box, peltier, heater, NTC Termistor, Blynk.*