

## ABSTRACT

*Human activities are closely related to body health. Various types of physical activities such as running and daily routines can affect human health overall. With the diversity of these physical activities and routines, it is important to monitor health to understand human body health effectively. The difficulty of direct and scheduled heart rate monitoring at an affordable cost necessitates a tool to facilitate this. The proposed product offers a solution to address this issue.*

*By leveraging advancements in wearable and IoT technologies, this product aids in heart rate monitoring, making it easier for users to monitor their health conditions. This Capstone Design proposes a wearable antenna with an integrated Electromagnetic Band Gap (EBG) structure and sensors to reduce body radiation. The antenna consists of components including copper patches, groundplanes, and an FR-4 substrate. The EBG components are also made of copper. The wearable device integrates with an IoT Device comprising an ESP32 microcontroller and two sensors: a pulse heart sensor for detecting heartbeats and a Neo 7M GPS for detecting running speed. This system integrates with Wi-Fi networks.*

*Testing results show that the heart rate detection device has an accuracy of 96.93% at rest, 83.80% while running, and 95.62% in detecting running speed. This product offers an effective and efficient solution for health monitoring, providing a more comfortable and affordable alternative to conventional hospital methods. The combination of wearable antenna technology with sensors for detecting running speed and heart rate results in a useful health solution. With its lightweight, flexible, and comfortable design, this wearable antenna provides accurate real-time monitoring and can help users better manage their health.*

*Key Word : Wearable device, EBG, IoT device, heart rate monitoring, running speed monitoring*