**The Development of Internet of Thing Remote laboratory Based on ESP32**

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Abstract: This paper will discuss the results of research on the development of an IoT remote laboratory based on ESP32 for learning advanced microcontroller courses at the Electrical Engineering Department of the National Institute of Technology Malang. IoT is closely related to the Industrial Revolution 4.0 because it is one of the main elements that influence many processes in the industry. From this background, this paper proposes the development of an IoT remote laboratory system to meet the need of the world of electrical engineering education in the era of the industrial revolution 4.0. The design of remote laboratory system is based on embedded system devices that are connected to the internet so that it can be accessed at any time by users from anywhere in the world. The IoT remote laboratory contains an IoT experiment module based on ESP32, that is connected to various sensors and actuators needed for learning and developing IoT-based systems. The remote laboratory is controlled by an embedded web server based on Raspberry Pi 4, which functions for user management and controlling the ESP32 experiment module. Remote laboratory users can program the ESP32 module remotely and can run the experiment module and observe it remotely via the webcam provided in each experiment module. The results of this IoT remote laboratory development are expected to contribute to providing laboratory facilities that are easily accessible remotely for Electrical Engineering education.

Keyword: Internet of thing, Remote Laboratory, ESP32, Raspberry Pi 4