Development of Embedded Systems and Internet of Things (IoT) Training Kit (IoT32)

UNDERGRADUATE THESIS

Submitted to Fulfill the Requirements of Bachelor's Degree in Electrical Engineering Education

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STATEMENT SHEET

I declare that this undergraduate thesis entitled Development of Embedded Systems and Internet of Things (IoT) Training Kit (IoT32) and its contents are genuinely my work. I do not plagiarize or quote in ways that are not under the scientific ethics that apply in the scientific community. For this statement, I am responsible if others found or claims there is a violation of scientific ethics or claims against the authenticity of this research.

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ABSTRACT

DEVELOPMENT OF EMBEDDED SYSTEMS AND INTERNET OF THINGS (IOT) TRAINING KIT (IOT32)

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Abstract. The COVID-19 pandemic had a significant impact on various sectors, for example, education sector. Due to the outbreak, teaching and learning activities should be carried out online. It becomes a problem in the practical course. This research discusses the development of IoT32 training kit that can be accessed remotely as Learning Media in Embedded Systems and IoT courses. It implements the ADDIE model (Analyze, Design, Develop, Implement, Evaluation). This research measures participants’ response after using the IoT32 training kit. The research can be concluded that the IoT32 examination showed that IoT32 is proper to be used for IoT practical work. The results also showed that the participants gave a positive response to the IoT32.

Keywords: ESP32, IoT, Training kit
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Prihatmoko, D. (2016). PENERAPAN INTERNET OF THINGS (IoT) DALAM
PEMBELAJARAN DI UNISNU JEPARA. Simetris : Jurnal Teknik Mesin, Elektro Dan Ilmu Komputer, 7(2), 567. https://doi.org/10.24176/simet.v7i2.769


