

## **ABSTRACT**

*Smart cards has now begun to expand as a learning support tool. As in the University of Telkom, it has used smart cards as a data collection media in class. But the system of implementing smart cards has not been effective resulting in frequent delays in the attendance data collection process. As well as students need a long process to find out the total percentage of attendance during lectures, because they have to open the campus's website first.*

*So it takes a new system design design that is able to overcome this. System design will be carried out on communication between smart cards and card readers. The communication uses a set of protocols, namely Application Protocol Data Unit (APDU). The protocol set will be identified through the output message on the smart card that is Answer to Reset (ATR). Furthermore, the results of the communication will be processed into a Graphical User Interface (GUI). This system will be equipped with security features, namely Secure Access Module (SAM).*

*The design was carried out on Mifare 4KB smart cards and readers in embedded systems. As well as designing a GUI on a Single Board Computer (SBC) based on Raspberry Pi 3.0. The tests carried out were, execution time when writing and reading a smart card, analyzing the command and response of APDU also GUI testing. Student data (NIM, Subject Code, Percentage of attendance) and lectures data (Name, NIP, Subject Code) will be displayed as a test scenario. Results testing obtained time response read, write and system (read and write) card response times of the card against a voltage of 4.2V-5V, which is 2-3% faster. While the results of testing the system response time to the number of characters with a voltage of 5V when full (142 characters) is 0.485 seconds. While when at normal character (122 characters) is 0.493 seconds. For APDU testing of smart cards, the fewer number of field maps, the faster the response time of the system.*

**Keyword:** *Smart Card, APDU, ATR, GUI, SAM*