

## Design and Programming Atmega *Microcontroller*

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### Abstract

Along with the demands for improving the quality of education, teacher competencies must face the challenges of changes that occur in society. Professional competence in Law No. 14 of 2005 requires that teachers be competent in the learning process. Technical skills teachers are needed to transfer knowledge, attitudes, and skills in vocational expertise to students. Therefore, improving the quality of learning, coupled with an increase in mastery of the substance of education, becomes an essential and fundamental thing that must be mastered by the teacher to strengthen the knowledge of expertise competencies. Concerning competency certification in dealing with the ASEAN economic framework (AEC) launched in 2016, students who graduate from Vocational High Schools must have a certificate about specific skills. In this case, the University of Muhammadiyah Gresik University is a university that also should conduct community education plans to conduct training on making Atmega microcontroller modules for SMK Manbaul Ulum Gresik students.

**Keywords:** Vocational High Schools, Training, Atmega.

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### Introduction

They are improving the quality of Indonesian human resources in vocational education in facing various challenges, especially those related to improving the process, results, and impact of learning. One of the learning processes depends on the quality of the teacher as a facilitator in the class. Along with the demands for improving the quality of education,

teacher competencies must face the challenges of changes that occur in society.

Law (Law) Number 14 of 2005 concerning Teachers and Lecturers (State Gazette of the Republic of Indonesia No. 157 of 2005), in the future referred to as the Teacher and Lecturer Law, requires adjustments in the administration of education and teacher development as a teaching



profession. As professional education staff, the teacher will be given by the certification body when the teacher concerned has fulfilled the competency requirements required by law. The competency in question is

1. Pedagogical Competence
2. Personality Competence
3. Social Competence
4. Professional Competence

Professional competence in Law No. 14 of 2005 requires that teachers be competent in the learning process. More specifically, technical skills teachers are needed to transfer knowledge, attitudes, and skills in vocational expertise to students.

Therefore, improving the quality of learning, coupled with an increase in mastery of the substance of knowledge, becomes an essential and fundamental thing that must be mastered by the teacher to strengthen the ability of expertise competencies.

Regarding competency certification in dealing with the ASEAN economic framework (AEC) launched in 2016, students who graduate from Vocational High Schools must have certificates about specific skills. In this case, the University of Muhammadiyah Gresik University is a university that also should conduct community education plans to conduct training on making Atmega microcontroller modules for SMK Manbaul Ulum Gresik students.

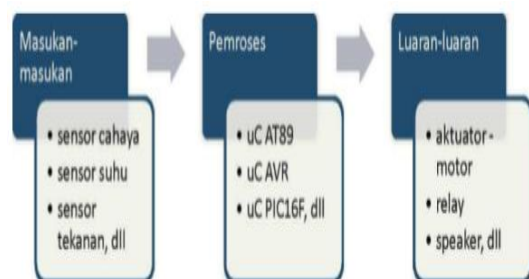
The training is useful to improve vocational students' professional competence to support the improvement of professional competence based on the mandate of competency standards and

essential competencies contained in the vocational curriculum in the fields of industrial electronics, industrial automation, electrical installations, and others. The majors have learning substance that demands mastery of microcontroller programming competencies.

### Literature Review

If we talk about microcontrollers, it is inseparable from the computer itself's understanding or definition; why? There are similarities between a microcontroller and a computer (or microcomputer), including:

Both have a central processing unit or better known as the CPU (Central Processing Unit), these CPUs both run programs from a location or place, usually from ROM (Read Only Memory) or RAM (Random Access Memory), Same- have RAM that is used to store data temporarily or better known as variables; Both have some output and input (I / O) that is used to carry out mutual communication with the outside world, through sensors (input) and actuators (outputs), pay attention to the chart shown in Figure 1.



**Figure 1.** Chart input, processing, to output

AVR Microcontroller Family is a microcontroller with modern architecture. Note Figure 3, Atmel makes 5 (five) types or types of AVR microcontrollers, namely:

### **Tiny AVR**

A versatile microcontroller (small, only 8 to 32 pins) with Flash Memory to store programs up to 16K Bytes, equipped with SRAM and EEPROM 512 Bytes.

### **Mega AVR**

High-performance microcontrollers, equipped with a Hardware Multiplier, can store programs up to 256 KBytes, equipped with 4K Bytes EEPROM and 8K Bytes SRAM.

### **XMEGA AVR**

The 8/16-bit XMEGA AVR microcontroller has new and sophisticated peripherals with improved performance, Event and DMA systems, and is an AVR family development for the low power and high-performance markets (low power and high performance).

### **AVR32 UC3**

High performance, low-power 32-bit AVR32 flash microcontroller. It has a flash of up to 512 KBytes and 128 KBytes SRAM.

### **AVR32 AP7**

High performance, a low-power 32-bit AVR32 application processor, has an SRAM of up to 32 KBytes.

## **Methods**

The form of activities that will be carried out in this service are as follows:

1. Lecture and demonstration methods, devotion participants are provided with the necessary mastery of the AVR series on board and programming basics.
2. Method of the demonstration by assigning tasks; in this phase, the target audience resolves the problem and its application through a practicum in a laboratory on a case by case basis to obtain a complete picture of the trained competencies.

## **Results and Discussion**

The results achieved in the community partnership program is: The ability or competence of vocational students, especially SMK Manbaul Ulum Kebomas Gresik, in terms of the Atmega Microcontroller architecture and programming basics. This activity's implementation took place in the Electric Energy Conversion Laboratory, Electrical Engineering Study Program, Muhammadiyah University Gresik.



**Figure 2.** Lecture on architecture and features of AVR Atmega Microcontroller





**Figure 3.** Connecting AVR Atmega Microcontroller



**Figure 4.** Programming the Seven Segment control

### Conclusions and Suggestions

Basic programming of the Atmega AVR Microcontroller for various functions, including :

#### 1. Control the On-Off LED

In addition to checking the microcontroller's output function, it also controls the flame of the LED with the program.

#### 2. Displays numbers on the Seven Segment

The second practice session is displaying numbers from 0 to 9 on the seven Segment.

#### 3. Control the DC Motor

Motor speed control is very much needed in industrial automation, so the third practice material is setting the DC motor rotation, clockwise or counterclockwise, along with the speed of rotation.

#### 4. Control a stepper motor

Same as in point 3, another type of DC motor that will be adjusted to the rotation and rotation speed direction is a stepper motor.

### References

- Andrianto, Heri.2012. Pemrograman Mikrokontroler AVR ATmega 16 Menggunakan Bahasa C (Code Vision AVR). Informatika, Bandung.
- ATMEL.2006.16-bit Mikrokontroler with 16K bytes in-System Programmable Flash.pdf. Orchard Parkway San Jose, CA 95131, USA.
- Delta, Agus. 2013. Elektronika Dasar : Pengenalan Praktis Mikrokontroler. Jakarta : PT. Elek Media Komputindo.
- Hadi, Mokh. Sholihul. 2008. Mengenal Mikrokontroler AVR ATmega 16. Universitas Brawijaya : Malang.
- Wang, Edi, Dkk.2009.*Pemrograman Dasar Microcontroller AVR dengan BASCOM-AVR (bag. 2)*. ITS : Semarang.