TIF21-22-43

Microprocessor-based Systems

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BASIC INFORMATION

Course Credit	2 / 100 minutes per Week
Course Type	Required
Course Classification	Engineering Topics
Prerequisites	-

STUDENT AND LEARNING OUTCOMES

Covered Student Outcomes

Development of Engineering Solution (b)	Modern Tools Utilization (e)
Engineering Design (c)	Multidisciplinary Teamwork(h)

Learning Outcomes

LO1 Students are able to explain the concept of microprocessor, definition of microcontroller and microcontroller system, explain the types of microprocessors from the architectural side (harvard and von-neumann), set of instructors (RISC and CISC), as well as number of bits (8, 16, and 32-bit).

LO2 Students are able to explain minimal system on STM32F103 microcontroller, addressing (addressing), and input-output (IO).

LO3 Students are able to explain Serial communication protocol based on SPI, I2C and communication bus in the industry, as well as ADC, DAC and PWM.

LO4 Students are able to design a simple system based on sensors and STM32F103.

COURSE DESCRIPTION

This course aims to give students the ability to understand the concept of microcontroller based systems, understand the constituent elements, how it works, to be able to make it independently. The learning process is done by lecturing, simulation using software, and practice directly by using evaluation board.

TOPICS

1. Introducing about the concept of microprocessor, definition of microcontroller and microcontroller system. Explained about the types of microprocessors from the architectural side (harvard and von-neumann), set of instructors (RISC and CISC), as well as number of bits (8, 16, and 32-bit).
2. Review of binary, octal, hexadecimal, simple-number operation and introduction of the integrated vision system based on Code Vision in C.
3. Introduction minimal system on ATmega microcontroller, addressing (addressing), and input-output (IO).
4. Communication systems commonly used in microcontroller systems include RS-232, RS-485, Zig-bee, and bus communication in the industry.
5. Introduction pulse width modulation (PWM) includes its generation mechanism, its benefits, and its type.
6. Convert analog to digital (analogue to digital converter).
7. Use of Code-Vision for port programming. The result is observed by simulation.
8. Recognize ADC system of ATmega microcontroller.
9. Can understand the design of ADC system program.
10. Know the internal and external interruption system of ATmega microcontroller system.
11. Can design interrupt handling routine.
12. Recognize serial communication system and PWM.
13. Can design serial communication program and PWM generation.
14. Can design an electronic system for interfacing microcontroller system with other peripherals outside microcontroller system.

REFERENCES

[1] Peatman, J.B., *Design With Microcontroller*, McGraww Hillinternational Edition, Singapore, 2018.

[2] Alexandridis, N., 1995, *Design of Microprocessor Based System*, Prentice Hall, Singapore, 2005

[3] ATMEL, *Data sheet Microcontroller Atmega 8535*, 2008.