CE14043 –Microprocessors

Required or Elective Course: Required

Catalog Description:

This course aims to provide information and public knowledge about microprocessors and microcontrollers such as the AVR series. The tutorial is general and it uses the ATMega16 to ATMega64 as examples. This course assists the students in understanding concepts related to the exciting technology around embedded systems and helps them to develop simple programs and to design electronic circuits using AVR based Atmel microcontrollers. The contents of the course are as follows:

- Electronical memories and their structure (SRAM, DRAM, ROM, PROM, EPROM, EEPROM, …)
- Non-electronic memories and their internal organization (Hard disk, CD, DVD, …)
- CPU – Memory connection styles and their addressing methods
- Introduction to microprocessors
- AVR Atmega16, 32, 64
- Inside Atmega64, General Purpose Registers (GPR), internal and external memories, computational unit
- Port programming
- Jump, conditional jump, implementing control structures (conditioning and loops) using jump instructions
- Direct and indirect addressing mode
- Signed and unsigned multiplication and division
- Bit operations, logical and arithmetic shifts, rotate, bitwise AND, OR, NOT and XOR
- Stack and its structure, subroutines, call and ret instructions
- Interrupt and its related registers
- Atmega64 Timer/Counter
- Analog to Digital Converters
- Digital to Analog Converters
- Analog and digital wave generators

Prerequisites by topic: Computer Architecture, Logic circuits

Textbooks and other required material:

[1] ATmega64 microcontroller datasheet.
[2] Muhammad Ali Mazidi, "The AVR Microcontroller and Embedded Systems Using Assembly and C", 2010.
[3] Richard H. Barnett, Sarah Cox, Larry O`Cull, "Embedded C Programming and the Atmel AVR", Delnmar Cengage Learning Publishing, 2011.
[4] AVR Assembler, Atmel, 2004.
[5] Atmel Studio, Atmel.