

ECE 6110 – Microprocessor Systems

Catalog Description:

Lec. 3. Cr. 3.

Prerequisite: ECE 3120 and ECE 4110 (5110) or equivalent.

Design of microprocessor-based controllers from sensor to output, including hardware and software for control, data acquisition, computation, and I/O.

Course Coordinator: Dr. Mohamed Mahmoud

Textbook(s) and Supplemental Material(s):

Required:

Huang, Han-Way. *The HCS12/9S12: An Introduction to Software and Hardware Interfacing*, 2nd Edition, Delmar Cengage Learning, 2010, ISBN: 978-1-4354-2742-6.

References:

Will be provided (if required)

Course Goal(s):

This course studies the organization, programming, and interfacing of microprocessors and microcontrollers. The student will do detailed design, programming (in assembly and C), and debugging of a typical modern microcontroller system (68HCS12) to clarify and reinforce the principles being taught. Emphasis is placed on practical techniques as well as theoretical concepts.

Instructional Outcomes for the Course:

Upon completion of this course, the student will be able to:

1. Understand the requirement of microprocessor systems
2. Use a microprocessor instruction set and different types of memory.
3. Write assembly programs and C programs for a microprocessor.
4. Execute and debug microprocessor programs.
5. Describe and draw block diagrams of the various types of input/output interfaces to a microprocessor.
6. Write interrupt service routines.
7. Write I/O routines using the Timer functions.
8. Utilize analog to digital converters in the microprocessor
9. Design and code peripheral interfaces using standard interfacing protocols including SCI, SPI and I²C.
10. Write technical reports

Course Topics:

1. Microcontroller/Microprocessor Concepts
2. Motorola HCS12 Microcontroller System
3. HCS12 Hardware organization
4. Basic HCS12 Assembly language programming
 - a. Registers, Memory Map
 - b. Addressing modes, Assembler Directives
 - c. Basic Instruction Set – arithmetic, loops, logical operators
5. Basic Hardware and Software Development
6. Advanced 68HCS12 Assembly Language Programming
 - a. Stack Operation
 - b. Subroutines, Parameter Passing
7. Parallel I/O Interfacing
 - a. 68HCS12 Parallel Ports
 - b. Interfacing with simple devices: LEDs, Seven Segment Display
8. C programming
9. Interrupts
 - a. 68HCS12 Exception processing
 - b. Interrupt Service Routines
10. Some more external peripherals: switches, pushbuttons, keypad, LCD, speaker
11. Timer Functions
12. Analog-to-Digital Converter
13. Serial Communication Interfaces (SCI)
14. I²C Interface
15. Serial Peripheral Interface Bus