Course: ECE 46500 – Embedded Microprocessor

Type of Course: Elective for EE and CmpE Programs

Catalog Description: Hardware and software design of small microprocessor-based systems, data acquisition, control, communication, I/O interface, small real-time operating systems, etc.

Credits: 3

Contact Hours: 3

Prerequisite Courses: ECE 36200

Corequisite Courses

Prerequisites by Topics: Computer programming in C or C++ (ENGR221/212) and microprocessor systems (ECE362); Currently, the course builds on the architecture and programming of 8051 family of processors.


Course Objectives: Provide the students an understanding of the principles and practices of embedded systems.

Course Outcomes: Students who successfully complete this course will have demonstrated:
1. An ability to learn to program in a high level programming language for embedded applications. (a [1], c [2], e [4])
2. An ability to learn the hardware of the 8051 family of microcontrollers. (a [1], c [2], e [4])
3. An ability to develop the mindset of multitasking and interrupt driven programming. (a [1], c [2], e [4])
4. Understand and utilize the serial communications protocols, such as RS232, I2C, CAN, and SPI. (a [1], c [2], e [4])
5. An ability to develop the ability of embedded system co-design of both hardware and software. (a [1], c [2], e [4])
6. An ability to develop an appreciation for efficiency of use of computing resources. (a [1], c [2], e [4], k [6])
Lecture Topics

1. C and hardware: Variables, Operators, Branching and Looping, Functions, Arrays, Structures and Pointers
2. Modular Programming: C Modules, Assembly Modules, Scope of Variables and Functions, Mixing Languages
3. Hardware: Basics and Assembly Language, 8051 Instruction Summary, Clock Cycles and Software Delays
4. Hardware: Memory, Ports and Expansion, Interrupts, Counters and Timers
5. RTOS: Multitasking, Basic and Commercial RTOS, Scheduler
6. RTOS: Real-Time Kernel Small/Big/Preemptive Kernels
8. Networks: I2C, SPI, CAN Bus, USB
9. Hardware: Digital Input with TTL, Switches and Buttons, Keypads, Keyboards and Digital Output LED, LCD
10. Hardware: Analog Input with A/D Conversion, and Analog Output with D/A Conversion
11. Overview of other processor family
12. Guidelines of schematic design and PCB layout

Computer Usage

High

Laboratory Experience

High

Design Experience

High

Coordinator

Guoping Wang, Ph.D.

Date

31/3/11