Course Number and Title:

**CompE-375: Introduction to Computer Programming**

Catalog Description:

Embedded system architecture and technology; IO programming using parallel ports (LEDs, switches, displays, keypads, speakers, serial ports, timers, and D/A and A/D converters; interrupts and real-time programming; program development and debugging tools; C language and assembler. Electronic considerations, logic levels, noise margin, AC/DC loading, timing analysis.

Credits: 3.0

Prerequisites by course: CompE-271

Textbooks and References:

Manufacturer's Data Sheets, Programming Reference materials
Web Resources, Instructor Notes

Course Learning Outcomes:

1. Understand the differences between embedded systems and general purpose PCs
2. Apply microcontrollers to typical embedded systems
3. Apply Cross-Development IDEs and command line tools for Programming in the C language
4. Perform Low Level Hardware and Software Interfacing for common embedded peripherals

Topics Covered:

1. Embedded Systems, Applications, Characteristics
2. Cross-development process - Host: edit; compile; Target: program and test
3. Volatile and other C language uses in Embedded applications
4. Implementation Dependencies: C data types: int, long, short, etc.
5. Bitwise operators: &, |, ^, and ~ for low level I/O and Memory manipulation
6. Discrete Inputs: Basic Switch and Matrix Keypad Input
7. Discrete Outputs: LEDs
8. Timer/Counters
9. Asynchronous Serial Communication (UART)
10. Synchronous Serial Communication (I2C, SPI, 1-Wire)
11. Simulation vs. In-system debuggers
13. Pointers, Tables, Interpolation, Preprocessing vs. Real-time calculation
14. Worst case analyses: Logic levels, noise margin, AC/DC loading, Timing Analysis
15. Interrupts, ISRs, Real-Time Programming, Scheduler, RTOS Implementations

Lab: E-207, 30 PCs, kits with AVR and ARM microcontrollers, proto board, misc. components

Class Schedule: Two 50 minute lectures and 3 hours of lab per week.