**COEN-4720: Embedded Systems Design**

**Class Schedule:** 3. credit course

**Course Coordinator**: Cristinel Ababei, Ph.D., Assistant Professor

**Course Materials:**

**Required:** none

**Course Description:**

This course introduces students to embedded systems, the types of hardware that can support such systems, and the interfacing used in embedded systems. The course is a combined laboratory and lecture course, which directly applies the embedded systems techniques using hardware description and assembly languages to field programmable gate array technology.

**Prerequisites**: EECE-3015 Digital Electronic Lab and COEN-4710 Computer Hardware.

**Selected Elective** in ELEN Computer Hardware & Software area.

**Required** course in the Computer Engineering program

**Contribution to Professional Component**:

Engineering Science 30 %

Engineering Design 70 %

**Course Goals:**

To enable students to design and implement an embedded system through the use of an interactive development environment (IDE) and embedded computer technology.

**Course Objectives:**

*By the end of this course, you should....*

1. Learn techniques to specify and develop embedded systems. Emphasis is on ARM Cortex-M3 microcontroller.
2. Utilize embedded platform architectures to design systems that support specific applications including communications, medical, automotive, and industrial.
3. Learn and apply testing and debugging strategies.
4. Conduct laboratory experiments using an evaluation board to confirm the analysis done in class.
5. Prepare informative and organized lab reports that describe the methodologies employed, the results obtained, and the conclusions made in a laboratory experiment.

**Contribution to Program Objectives**: partial fulfillment of Criterion 3 objectives A, B, C, E, G, I, K

**Course Topics:**

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| **Week** | **Topics** |
| 1 | Introduction,C programming (data structures, pointers, functions) |
| 2,3,4,5,6 | C programming (data structures, pointers, functions)Cortex-M3 Basics, Implementation overview, Instruction set, Memory systemLPC1768 BasicsNVIC and interrupt control, Basic I/O, Interrupts and timers GPIOs, SysTick, Timer0, ADC, UART0/1 |
| 7,8,9,10 | NVIC and interrupt control, Basic I/O, Interrupts and timersDirect memory access (DMA)CAN1/2, LCD displays |
| 11,12,13 | Program design, WiFi, BlueToothUSB audio, Stepper motor control |
| 14,15 | RTOS, Introduction to Ethernet, TCP/IP |
| 16 | Final projects |