**ELC 411 - Embedded Systems**

Fall Semester

2012-13 Catalog Data: ELC 411/Embedded Systems 1 course unit

*Prerequisites:* ELC 251, ENG 312

*Corequisites:* ELC 343

This course deals with embedded systems and their interactions with their physical environments. It focuses on embedded system design issues such as limited memory, cost, performance guarantees, real-time operations, power, and reliability.

**Textbook:** 1**.** Computers as Components by M. Wolf, Morgan Kaufmann, Third Edition, 2012

**Reference**: 2. PSoC3/5 Reference Book by E.H. Currie and D. Van Ess, Cypress Semiconductor Corporation, 2010

**Course Objectives\*:**

Objective 1: To introduce students to the basic principles of system design. [a, b, c, e, k, l, m]

Objective 2: To develop students’ ability to identify, formulate and solve design problems for analog-digital systems constituted as embedded systems. [a, b, c, e, g, k, l, m]

**Topics Covered:**

1. System modeling and design concepts

2. Design and/or selection of real-time embedded systems for digital control and/or processing of analog system signals:

a. Data Acquisition elements: transducers, amplifiers, filters, and A/D converters in conjunction with concomitant digital data processing elements

b. Digital Signal Processing Module specifications: CPU speed with memory requirements for specific, real-time digital control and/or processing applications.

3. Embedded System integration

**Evaluation:**

A. Midterm Examination

B. Final Examination

C. Homework assignments

D. System Architecture Project

**Performance Criteria\*\*:**

Objective 1

1. An understanding of the application of microcontrollers for solving system design problems. (A)

Objective 2

1. An understanding of the ARMv7 Instruction Set Architecture (A,C)
2. The ability to analyze the performance requirements of an application, and select appropriate ADC and DAC conversion technology. (B,C)
3. The ability to analyze the performance and power requirements of an application, and select a microcontroller based on CPU architecture and clock rate. (B)
4. The ability to analyze a system architecture to determine whether and how to use interrupt-based processing. (B)
5. An understanding of communication protocols commonly used in embedded systems. (B, C)
6. The ability to design and analyze a real-time hardware/software architecture for an embedded system. (D)

**Contribution of course to meeting the professional component:**

Engineering Science: 50%

Engineering Design: 50%

**Prepared by:** Larry Pearlstein, Assoc. Professor **Date:**

\*Lower case letters in brackets refer to the student outcomes of the Electrical/Computer Engineering Program

\*\*Letters in brackets refer to evaluation methods used to assess student performance.