METROPOLITAN STATE UNIVERSITY OF DENVER
Office of Academic and Student Affairs

REGULAR COURSE SYLLABUS

College of: Professional Studies

Department: Engineering and Engineering Technology

Prefix & Course Number: CPE 4370 **Crosslisted With*:** _____

Course Title: Embedded System Design I

Transcript Course Title (30 characters): Embedded System Design I

Check All That Apply: Required for Major: X Required for Minor: Specified Elective: _____

Required for Concentration: _____ Elective: ___ Service Course:

To receive Title IV financial aid funds, all institutions of higher education must comply with the federal definition of a credit hour. The Higher Learning Commission requires institutions to maintain policies and procedures for verifying compliance with this definition.

> ***Federal Credit Hour Definition:*** *A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than:*
> *(1) one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work each week for approximately fifteen weeks for one semester or trimester hour of credit, or ten to twelve weeks for one quarter hour of credit, or the equivalent amount of work over a different amount of time; or (2) at least an equivalent amount of work as required in paragraph (1) of this definition for other activities as established by an institution, including laboratory work, internships, practica, studio work, and other academic work leading toward to the award of credit hours. 34CFR 600.2 (11/1/2010)*

Credit Hours: 3 (2+2) **Schedule Type**: B **Grade Mode**: L

Face-to-Face or Equivalent Hours per course:

Lecture 30 Lab 30 Internship _____ Practicum _____ Other (please specify type and hours):_____

Additional Student Work Hours per course: 90

Variable topics umbrella course: No X **Yes** _____ If yes, number of credits/repeats allowed _____

Specified repeatable course: No X **Yes** _____ If yes, number of credits/repeats allowed _____

Prerequisite(s): CPE 2350 and CPE 3330 (with a grade of "C" or better for all prerequisites)

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Banner Enforced Coding:

Prerequisite(s): CPE 2350 and CPE 3330 (with a grade of "C" or better for all prerequisites)

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Registration restrictions: Level _____ **Class** _____**Program/Major** _____ **Student attribute** _____

Catalog Course Description:

This class will explore the fundamentals of embedded system hardware and firmware design. The following issues will be discussed, such as embedded processor selection, hardware/firmware partitioning, number conversion, computer hardware structure, memory technology, logic circuits, development tools, firmware architecture, firmware design, and firmware debugging. An industry standard microcontroller will be studied. And its architecture and instruction set will be covered. The students will apply a microcontroller demo board for their designs. The programming will be implemented in *Assembly* and *C* languages.

Specific Variable Topics Course Description (if applicable, umbrella course description included above):

Required Reading and Other Materials will be equivalent to:

Huang, Han-way. (2004).*PIC Microcontroller: An Introduction to Software & Hardware Interfacing*. Or latest edition. Clifton Park, NY: Thompson Delmar Learning.

Specific, *Measurable* Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. Understand the basic concepts of embedded system design
2. Know how to choose an appropriate microcontroller for system design
3. Define the architecture of microcontrollers
4. Use *assembly* and *C* languages to program
5. Write interrupt-driven programs
6. Communicate an microcontroller with external devices by using I/O ports
7. Use hardware and software development techniques, skills, and computer tools to solve a real-world problem

Detailed Outline of Course Content or Outline of Field Experience/Internship (experience, responsibilities and supervision):

I. Introduction to Embedded Systems and Microcontroller-based Circuit Design

II. Introduction to Microcontroller

III. Instruction Sets

IV. Development Tools

V. Advanced Assembly Programming

VI. C Programming Review and the Use of the C Compiler

VII. Interrupt, Resets and Configuration

VIII. I/O Ports

IX. Application Examples

Evaluation of Student Performance:

1. Examinations
2. Written Assignments
3. Design Demonstrations/ Lab reports