

Department	Electrical and Computer Engineering
Course Number	EE 465
Course Title	Real Time Microcontroller Applications
Course Designation	Required for CpE, Elective for EE
University Catalog Description	S 4 cr. LEC 2 LAB 2 Prerequisite: EE371 -- Lecture/laboratory exposure to micro controller hardware and software applications, serial and parallel I/O, timing, interrupts LCDs, keypads, A to D conversion, and a project realizing a real time control problem.
Faculty Coordinator	Randy M. Larimer
Prerequisite by Topic	Programming skills in assembly language, a functional understanding of a microcontroller system and its major components, and digital logic design.
Textbook	None Required: Specific Microcontroller Data Books and Application Notes are used. Recommended Text: Fredrick M. Cady, "Software and Hardware Engineering, Assembly and C Programming for the Freescale HCS12 Microcontroller", 2008
Course Objectives	The course objective is to provide sufficient detailed knowledge of a microcontroller so that students can breadboard and program a microcontroller and demonstrate its function in a real-time application in the laboratory
Course Learning Outcomes	At the conclusion of EE 465, students are expected to be able to: <ol style="list-style-type: none"> 1) Design, breadboard, and program a microcontroller system; 2) Design, write, and document assembly-language software for a microcontroller system; 3) Understand and use various IO devices such as: keypads, A to D converters, LCD modules, mechanical relays, solid state relay; 4) Be able to design basic I/O drivers and microcontroller device interfaces, I2C; 5) Understand the basic types of memory used in microcontrollers; 6) Understand the hardware and software resources required for real-time microcontroller applications
Topics Covered	<ol style="list-style-type: none"> 1) Microcontroller instruction set; 2) System clock and Power on Reset; 3) Addressing modes; 4) I/O Ports; 5) Interrupts; 6) Pseudo Data Bus and Address decoding; 7) Keypad scanning; 8) LCD module programming; 9) Analog to Digital conversion and Digital to Analog Conversion; 10) Transistor switching circuits and I/O drivers; 11) I2C Temperature Sensors and Real-Time Clocks; 12) Thermoelectric coolers.
Class/Laboratory Schedule	The class is a combination of lecture and lab. The class meets twice per week for two hours total, and the lab twice a week for four hours total.
Professional Component (Criterion 5)	This course has a very strong emphasis on both the hardware and software aspects of microcontroller systems.
ECE Program Outcomes	EE 465 supports the following program outcomes: <ol style="list-style-type: none"> c. an ability to design a system, component, or process to meet desired needs. k. an ability to use the techniques, skills and modern engineering tools necessary for engineering practice. n. an ability to program microcontroller/microcomputer systems using assembly and high-level languages. q. an ability to implement a real-time system.
Total Credit Hours	4
Prepared by	Randy M. Larimer 5/18/2009