COURSE NUMBER: Ve373	**COURSE TITLE:** Microprocessor Based System Design
CREDIT: 4	**PREREQUISITES:** Ve270 and Ve370 or instructor permission
TEXTBOOKS/REQUIRED MATERIAL: None	**INSTRUCTOR:** Gang Zheng **DATE OF PREPARATION:** June 10, 2012 **DATE OF UC APPROVAL:** Oct. 30, 2013
INSTRUCTOR(S): Gang Zheng	**SCIENCE/DESIGN:** n/a
CATALOG DESCRIPTION: Principles of hardware and software microcomputer interfacing; digital logic design and implementation. Experiments with specially designed laboratory facilities. Introduction to digital development equipment and logic analyzers. Assembly language programming. Lecture and laboratory.	**COURSE TOPICS:** 1. Introduction to embedded systems 2. PIC MCU architecture, registers, memory organization, 3. PIC32 instruction set, MIPS assembly programming 4. Embedded C Programming 5. I/O ports and operations, intro to MPLAB IDE 6. Timers and applications 7. Interrupts 8. Interaction with external devices, LCD controller 9. Power-saving operations 10. Input capture, output compare, PWM 11. Analog to digital converter 12. Serial communications, UART 13. SPI and I2C 14. Introduction to DMA and CAN
COURSE STRUCTURE/SCHEDULE: Lecture: two 90 minutes plus one 45 minutes lectures each week; Laboratory: 1 per week, 2.5 hrs	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. To teach students PIC microprocessor architecture and various peripherals [2,3,4,5,6,7] 2. To teach students how the hardware and software components of a microprocessor-based system work together to implement system level features. [1,2] 3. To teach students the operating principles of, and provide hands-on experience with, common microprocessor peripherals such as UARTs, timers, and ADC. [4,5,7] 4. To provide practical experience in applied digital logic design and embedded C programming.[1,2] 5. To expose students to the tools and techniques used by practicing engineers to design, implement, and debug microprocessor-based systems. [1,2,3,4,5,6,7]
COURSE OUTCOMES [Program Outcomes in brackets]	After completing Ve373, students should: 1. Be able to implement a complete microprocessor-based system using the components provided in the lab, including input and output peripheral devices, and simple but complete control software. [c,e,h,k] 2. Given a digital device and its reference manual, be able to write control software in assembly or C programming languages to initialize and perform operations on the device. [a,g,k] 3. Be able to interface external controllers, such as an LCD controller through, I/O ports [c] 4. Be able to handle timed signals using internal timers and timing management system [c] 5. Be able to handle multiple peripherals using interrupts [c] 6. Understand the importance of, and be able to apply power saving operations in microprocessor-based system designs [h,j] 7. Understand basic communication techniques used in modern embedded systems, and be able to establish communications between embedded devices using UART, SPI, or I2C [c]
ASSESSMENT TOOLS [Course Outcomes in brackets]	Homework [2,3,4,5,6,7] Midterm Exam [2,4,5] Final Exam [3,4,5,6,7] Lab experiment [2,3,4,5,6,7] Course project [1]