ENG EC450 Microprocessors

2008-2009 Catalog Data:
Prereq: ENG EC 327 and ENG EC 312. This course focuses on the interface between the digital world and the physical world. Hardware and software design methodology for embedded microcomputers. Open laboratory and projects and considerable hands-on work. Architecture, hardware, I/O, interrupts, memory organization and decoding. Uses the TI MSP430 family microcontrollers. Peripheral devices including general digital I/O, timers, analog to digital converters, and synchronous serial interfaces SPI and I2C. The course stresses the dependency of hardware and software design on project identification, rationale, and goals. Includes lab.

Class/Lab Schedule:
LEC: 4 hrs/wk, LAB: hands-on course requires approx. 5 hrs/w with lab assistants / teaching staff available for advice and homework interviews

Status in the Curriculum: Required

Textbooks and other required materials:
Online course notes including examples and links to online reference materials.
Reference:
Micontroller hardware and architecture manuals (currently TI MSP430 family processors)

Coordinator:
Roscoe Giles, Professor, ECE Department

Prerequisites by topic:
We build on some engineering basics: electrical quantities and units, Ohm's law , some exposure to programming, block diagrams, basic electric circuits, rudiments of signals and systems. A minimum of engineering maturity: responsibility, and accountability, budgeting of resources, teamwork, problem solving, and self-discipline.

Goals:
To understand the computer as a hardware component of a system, particularly how software relates to the behavior of the hardware.
To learn to design systems that incorporate a microcontroller to achieve a desired task.
To develop an integrated view of the engineering design process using the development cycle of microprocessor applications as a concrete, hands-on platform.
To develop a first-hand acquaintance with broadly useful concepts and techniques (e.g, feedback, table dispatching, task interrupts, digital synthesis of analog behavior) that are likely to enhance one's effectiveness in professional life.
To participate effectively in a project team, including project design and planning and team communication and organization.

Course Outcomes:
As an outcome of completing this course, students should
1) Have become more competent at exploiting the complementarities between hardware and software resources.
2) Understand the role of low-level software in real-time process control.
3) Have acquired competence at developing an application from specs to prototyping, construction, and evaluation
4) Develop capabilities for engineering teamwork with actual partners (project teammates) and virtual ones (reading specifications and explanations, producing usable documentation, etc.)

Course Outcomes mapped to Program Outcomes:

Program Outcomes	a	b	c	d	e	f	g	h	i	j	K
Course Outcomes	1-3	1-2	3	4	1-3	3,4	3,4	3	1-3	1-2	1-4
Emphasis (1-5)	3		5	4	5	4	4	4	2	4	5S

1=not at all; 5=a great deal;

Topics in Project Assignments:
Synthesis of multiscale time patterns---waveshapes, notes, rhythms
Music Player
Variable speed motor control.
Keyboard interface
Wireless remote control.
Temperature regulator.

Contribution of Course to Meeting the Professional Component:
Engineering topics: 100%
Math & Basic Science: 0%
General Education: 0%

Status of Continuous Review of this Course:
Review / update of projects after each semester. Update and review of major components (software/hardware platform) annually with major changes made about every 3-4 years.

Prepared by: Roscoe Giles, Professor Date: 14 June 2009