CALIFORNIA STATE POLYTECHNIC UNIVERSITY, POMONA

ETE 240

COURSE OUTLINE

Course Information	**ABET Unit Classification** (4 Quarter Units)
Department: Engineering Technology	Math:
Course Number: ETE 240/L	Basic Science:
Course Title: μP Syts & Assb Lang. Prog.	Engineering Topics: 4
Revision Date: 10/18/2004	*Contains significant design content:* Yes
Revised by: Tariq Qayyum	Other:
Compliant: Catalog 2004/05	Curriculum Designation: Required

I. Catalog Description

ETE 240/240L Microcomputer Systems & Assembly Language Programming/Lab (3/1)

Software model and instruction set of the 68HC11-microcontroller, using the monitor program for machine language and assembly language programming, elementary I/O programming using the system timer, keypad and LCD units. Three (3) lecture/problem solving and 1 three-hour laboratory. Prerequisite ETE 230.

II. Prerequisites and Corequisites

ETE 230. ETE 240 and 240L are corequisities

III. Textbook and/or other Required Material

Text:
Huang, Han-Way, MC68HC11 An Introduction. Software and Hardware Interfacing.
West Publishing
References:
1. M68HC1 1 Reference Manual, M68HC1 1 RM/AD REV 3 Motorola
2. MC68HC1 1A8 Programming Reference Guide MC68HC1 1A8RG/AD Motorola

IV. Course Objectives

Upon successful completion of this course, each student will be able to:

1. Convert numbers from one base to another (base 10, 2, 8 and 16): and be proficient in working with 2's complement numbers, including overflow.
2. Decode and encode 68HC11 machine-language instructions, or equivalent.
3. Analyze 68HC11 machine language programs, and determine their outputs and/or results, or equivalent.
4. Write machine-language programs to achieve specific purposes, or equivalent.
5. Analyze assembly-language programs, or equivalent.
6. Write assembly-language programs to accept input from the keyboard and to output information to the LCD. This will include the use of sub-routines.
7. Work as a team.

V. Expanded Course Description

A. Expanded Description of the Course

1. Review of computer codes and number systems.
   a. Binary numbers; octal/hex/decimal number conversions.
   b. 2's complement arithmetic; overflow detection.
   c. Computer codes, ASCII, etc.

2. Software model of the 68HC11 microcontroller
   a. The registers; memory organization; addressing.
   b. The instruction word format.
   c. Addressing modes.
   d. Input/output operations.
   e. The complete instruction set.

3. 68HC11 machine-language programs
   a. Analyzing programs.
   b. Writing machine-language programs.

4. 68HC11 assembly-language programs
   a. Introduction to the edit/assembly process.
   b. Analyzing assembly-language programs.
   c. Writing elementary assembly language programs.
   d. Using data transfer; arithmetic, logical and rotate instructions; flag control, compare and jump instructions; loop and string-handling instructions.

5. I/O Ports

B. Typical Laboratory Experiments

Lab 1. Communicating with the 68HC1 1; using the monitor program, downloading programs to the microcontroller.

Lab 2. Using the monitor program to examine and modify registers and memory locations. Write and execute machine language programs.

Lab 3. Write and execute assembly language programs to manipulate binary, BCD and ASCII data and/or codes.

Lab 4. Explore the LCD and keypad capabilities.

Lab 5. Write and execute subroutines for Shift, Mask, Boolean, ASCII and Packing.

Lab 6. Exercise interrupts for timers and event counters.

VI. Class/Laboratory Schedule

Lecture: Two 75 minutes sessions per week
Lab: One three hours session per week

VII. Contribution of Course to Professional Component

Students learn about Microcomputer and Microcontroller systems. Learn assembly language programming using MC68HC11 Axiom board. Students learn to write programs in assembly

language using control structures, subroutines, stack operations and interrupts. Students also learn to compile and execute programs using 68HC11 microcontroller.

Wide ranges of experiments are performed in the laboratory using 68HC11 Motorolla board. The experiments also include interfacing switches, LEDs, Hex keypad and LCD display.

VIII. Evaluation of Students

The instructor evaluates outcomes using the following methods:

- Homework assignment submittals and Quizzes
- Examinations: Midterms and Final
- One-on-one discussions during office hours
- Laboratory experiments
- Laboratory reports

The student grades are typically based on the following factors:
quizzes, homework, midterm exams, laboratory reports and final Exam

IX. Relationship of Course to Program Outcomes

Crse Obj	Program Outcomes										
	(a) **Use of modern tools of discipl**	***(b)*** **Use of math, science, Engg & Tech**	***(c)*** **Do experi -ments**	***(d)*** **Dsn of sys & compo nents**	***(e)*** **Work on teams**	***(f)*** **Do Tech probs**	***(g)*** **Eff Com**	***(h)*** **Life-long learn**	***(i)*** **Prof, ethics, social resps**	***(j)*** **Prof, soc, globl, diversity**	***(k)*** **Qual, Cont impr, timeli ness**
1		X				X					
2		X				X					
3	X	X				X					
4		X				X					
5	X	X	X		X	X					