

Texas A&M University–Corpus Christi
College of Science and Technology
Department of Computing Sciences
Engineering Technology

ENTC 3418 Microprocessors and Microcontrollers
Fall 2009

COURSE INFORMATION

Meeting Time: TR 5:30 – 6:45 p.m. (lecture) and 7:00 – 8:15 p.m. (lab)

Meeting Place: ST 111 (lecture and lab)

PROFESSOR INFORMATION

Dr. Ruby Mehrubeoglu (Dr. M.)

E-mail Address: ruby.mehrubeoglu@tamucc.edu

Office Phone: (361) 825-3378

Office Hours: T 2:00-4:00 p.m., W 1:00-2:00 p.m., F 9:00-11:00 a.m., and by appointment

COURSE DESCRIPTION

Introduction to microprocessor architecture, assembly language programming, and interfacing. Topics include computer organization, addressing modes, instruction set, interrupts, timing, memory, and interfacing. **Prerequisite:** COSC 1435. Fall.

TEXT

1. Scott MacEnzie, Raphael Chung-Wei Phan, *The 8051 Microcontroller, 4th Ed.*, Prentice Hall, 2007.

LAB MANUALS

None to buy. Handouts will be used. Also, the following user manuals are available in the ET lab for students' use:

1. Siemens. C504 8-bit CMOS Microcontroller User's Manual published by Siemens AG.
2. Macro Assembler and Utilities, 02.2001, Keil Software
3. Getting Started with μ Vision 3 and the C51 Microcontroller Tools, 02.2001, Keil Software

INSTRUCTIONAL METHODS AND ACTIVITIES

Methods and activities for instruction include the following: lectures, group discussions, homework assignments, lab experiments/exercises, software simulation, and a project.

EVALUATION AND GRADE ASSIGNMENT

Evaluation of student performance is based on homework assignments, quizzes, two midterms, lab experiments/exercises, a project, and a final exam. Tests, except the final, are graded and returned within a week from the date they are taken. No makeup exams are given in this course.

You may examine the final exam within four weeks after the final grades are mailed to you. The final grade is assigned as follows.

	Points	If	Grade
Homework/Quizzes	10	$90 \leq \text{total}$	A
Prelabs/Lab exercises/reports	20	$80 \leq \text{total} < 90$	B
Midterm Examination 1	15	$70 \leq \text{total} < 80$	C
Midterm Examination 2	15	$60 \leq \text{total} < 70$	D
Final Project Proposal Presentation/Report	5	$\text{total} < 60$	F
Final Project Presentation/Report	10		
Project Notebook + Project Demo	5		
Final Examination	20		
Total	100		

STUDENT LEARNING OUTCOMES

At successful completion of this course, students will have demonstrated their ability to:

- Compare the characteristics of microcontrollers and microprocessors
- Convert between decimal, binary, octal and hexadecimal numbers
- Perform addition and subtraction in different bases (10, 2, 8, and 16)
- Understand binary codes, ex. ASCII, gray code, BCD, etc.
- Contrast machine, assembly, and high level programming languages
- Use software development tools (Keil software) to program microcontrollers
- Write assembly language programs that use the microcontroller addressing modes and instruction set
- Develop assembly language programs for I/O applications using the microcontroller ports, including building a circuit, downloading program, and testing operation
- Write and test assembly language programs (using a hardware circuit) that use the 8051 timers
- Write and test assembly language programs that use the external 8051 interrupts.
- Design, develop and analyze microcontroller interface circuits
- Demonstrate effective communication skills

ATTENDANCE POLICY

You are advised to attend all lectures and laboratory sessions. If you miss a class period, you are responsible for material covered/announced during your absence.

ACADEMIC HONESTY

Your attention is called to the University policy in the Student Handbook.

ASSIGNMENTS

Late assignments will be accepted with penalty. 20 points will be deducted, out of a total of 100, for each late day. Assignments may be turned in before the due date.

LAB EXPERIMENTS

The goal of the laboratory sessions is to analyze and verify the theoretical ideas learned in the classroom. Most experiments require written reports. The report is due one week after the

experiment is performed. Late reports will be accepted with penalty. 20 points will be deducted, out of a total of 100 points, for each late day. Reports may be turned in before the due date. Students should be prepared to spend more hours than scheduled to finish the experiments, if needed.

FINAL PROJECT

Students, in groups of two, must complete a final project. Project ideas and guidelines will be handed out in class. The student may come up with his/her own project, pending prior approval of the instructor.

BONUS

Bonus points will be given to those projects that have the quality of a student paper, and is submitted to a local student research conference. The instructor will provide details for the conference.

EMAIL ADDRESS

You must supply the instructor with a current email address and check your email account often. You supply your email address by sending an email message by the end of the first week to ruby.mehrubeoglu@tamucc.edu. In the subject area, type ENTC 3418 and write your.

SUPPLEMENTARY READING LIST

1. Jonathan Valvano, *Embedded Microcomputer Systems*, Thomson Brooks/Cole, 2003.
2. Barry Brey, *The Intel Microprocessors: Architecture, Programming, and Interfacing*, 6th Ed., Prentice Hall, 2003.
3. Mazidi and Mazidi, *The 80x86 IBM PC and Compatible Computers (Volumes I and II)*, 4th Ed., Prentice Hall, 2003.
4. Muhammad Mazidi and Janice Mazidi, *The 8051 Microcontroller and Embedded Systems*, Prentice Hall, 2000.
5. Walter Triebel and Avtar Singh, *The 8088 and 8086 Microprocessors: Programming, Interfacing, Software, Hardware, and Applications*, 4th Ed., Prentice Hall, 2003.
6. Michael Pont, *Embedded C*, Addison Wesley, 2002.
7. Peter Abel, *IBM PC Assembly Language and Programming*, 5th Ed., Prentice Hall, 2001.
8. Scott MacKenzie, *The 8051 Microcontroller*, 3rd Ed., Prentice Hall, 1999.
9. James Stewart and Kai Miao, *The 8051 Microcontroller: Hardware, Software, and Interfacing*, 2nd Ed, Prentice Hall, 1999.
10. Tom Shultz, *C and the 8051*, 3rd Ed., PageFree Publishing, Inc., 2004.
11. Ramesh Gaonkar, *Fundamentals of Microcontrollers and Applications in Embedded Systems (with the PIC18 Microcontroller Family)*, Clifton Park: THOMSON Delmar Learning, 2007.
12. Kenneth Ayala, *The 8051 Microcontroller*, 3rd Edition, Clifton Park: THOMSON Delmar Learning, 2005.

TENTATIVE WEEKLY SCHEDULE *

W K	DATES	Readings	Topics	Labs/ Exams
1	08/27	Ch. 1 Handouts	Course requirements, Introduction to Microprocessors and microcontrollers	Lab Safety
2	09/01, 09/03	Ch. 2, App. E, F, H Handouts	Hardware Summary; Numbering systems: binary arithmetic, codes, conversions	Lab 1 Tutorial
3	09/08, 09/10	Ch. 3 App. A, B, C, D	Instruction Set Summary: Addressing Modes Logic and Boolean Instructions; Jump Instructions	Lab 2 (Prelab 2 & Lab 1 reports due)
4	09/15, 09/17	Ch. 5	8051 Microcontroller Architecture Serial Port Operation and Data Communication	Lab 3 (Prelab 3 & Lab 2 reports due)
5	09/22, 09/24	Ch. 7	Assembly Language Programming: Arithmetic/Logic Operations; Moving Data Operations	Lab 4, Midterm 1 (Lab 3 Report Due)
6	09/29, 10/01	Ch. 9	Program Structure and Design	Lab 5 (Prelab 5 & Lab 4 reports due)
7	10/06, 10/08	Ch. 4	Timers	Lab 6 (Prelab 6 & Lab 5 report due)
8	10/13, 10/15	Ch. 6	Interrupts	Lab 7 (Prelab 7 & Lab 6 report due)
9	10/20, 10/22	Ch. 10, 11	Microcontroller Design and Interface Handout project guidelines	Lab 8, Midterm 2 (Lab 7 Report Due)
10	10/27, 10/29	Ch 11, 12	Applic	Lab 9 (Prelab 9 & Lab 8 report due)
11	11/03, 11/05	Ch. 8, 12	8051 Programming in C Project proposal Reports/Presentations	Lab 10 (Prelab 10 & Lab 9 report due)
12	11/10, 11/12	Ch. 13, 14 Handouts	Advanced Topics in Microcontrollers/processors Project (conference paper due (optional))	(Lab 10 report due) Project
13	11/17, 11/19		Project / Guest Speaker	Project
14	11/24, 11/26		Project THANKSGIVING DAY HOLIDAY	Project
15	12/01, 12/03		Project + BONUS paper, Final Project Presentations	Project
16	12/08		Exam Review, Project Reports	
Final examination: Thursday, 10 Dec. 2009, 4:30-7:00 p.m.				

* Changes, if any, will be announced in class

SAFETY

The safety of students, faculty, staff and visitors to the ET laboratories is of paramount importance to the ET programs. You must follow safety procedures and use personal protective equipment as required in each laboratory. Any student that attempts to use equipment without authorization or that violates any safety policy or regulation will be immediately removed from the laboratory.

FOOD AND DRINKS

Eating and/or drinking is not permitted in the LAB.

NOTICE TO STUDENTS WITH DISABILITIES: Texas A&M University-Corpus Christi complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disabilities. If you suspect that you may have a disability (physical impairment, learning disability, psychiatric disability, etc.), please contact the Services for Students with Disabilities Office, located in Driftwood 101, at 825-5816. If you need disability accommodations in this class, please see me as soon as possible.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services Office for assistance at (361) 825-5816.

ADVISING

The College of Science and Technology requires that students meet with an Academic Advisor as soon as they are ready to declare a major. The Academic Advisor will set up a degree plan, which must be signed by the student, a faculty mentor, and the department chair. The College's Academic Advising Center is located in Faculty Center 178, and can be reached at 825-6094.

GRADE APPEALS

As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at http://www.tamucc.edu/provost/university_rules/index.html. For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.