Course Information

Instructor

Ed Casas. You can contact me by e-mail (edc@ee.ubc.ca) or at my office in MCLD 155 (822-2592) (preferably during office hours). MCLD 155 is in the basement of the Electrical and Computer Engineering building.

Lectures

Mondays and Wednesdays, 9:30 to 10:30 AM from January 5 to April 8 in Forward (FORW) 303. No lectures February 16 or 18 due to mid-term break.

Tutorials

Fridays, 9:30 to 10:30 AM from January 9 to April 3 in FORW 303. No tutorial February 20.

Office Hours

Office hours will be scheduled at the first lecture.

Teaching Assistants

Jun Zhou (junz@ee.ubc.ca) and Shahram Davari (shahramd@ee.ubc.ca). Jun and Shahram will help students in the lab and will mark lab reports and assignments.

Labs

Monday or Wednesday from 2:30 to 4:00 PM in MCLD 112.

The labs are an integral part of the course and *all labs must be completed to pass the course*. Each lab requires you to write a computer program and/or wire up a circuit to control the lab hardware.

Lab Schedule

TAs will be in the labs during the scheduled lab times. You will be asked to sign up for either Monday or Wednesday labs at the start of the course. You will have two 1.5-hour lab sessions to complete each lab.

You may also use the lab whenever it is not in use by another course (i.e. when there are no TAs in the room). Room 112 is open 24 hours a day but the building is locked outside normal working hours. TAs will only be available during your scheduled lab time.

The lab schedule is as follows:

Lab	Topic	Starts	Report Due
1	A Simple C Program	Jan 19	Feb 2
2	Programming a Keypad and Display	Feb 2	Feb 16
3	Washing Machine Controller	Feb 23	Mar 9
4	Microcontroller	Mar 9	Mar 16
5	T.B.D.	Mar 23	Apr 6

The topic of the fifth lab will be selected depending on the students' interests.

Lab Marking

You must print out your program and demonstrate it to the TA before the end of your second lab session. The TA will then ask you one or two questions about your program to make sure you understand the material. If did your own work you shouldn't have any problems answering the question(s).

A short lab report must be handed in to the APSC 380 assignment box (see below) before 9:30 AM on the due dates shown above. This report should include a brief description of your program or circuit, source code listings and schematics, and answers to any questions posed in the lab notes.

Each lab will be marked out of 5 as follows:

correct program/circuit	3
answers after demo	1
accurate/complete/neat report	1

If a lab is not demonstrated on time you will receive a mark of zero for that lab (0/5). If the report is not handed in on time you will receive zero for the report (0/1).

The equipment available in the lab changes during the term and it may be difficult to complete or demonstrate your lab after the scheduled dates. Remember, you must demonstrate all labs, even if you would get a mark of zero, to pass the course.

Labs are to be done individually. Students are encouraged to seek help from classmates but copying is not allowed and each student must submit an original solution. Possible penalties for plagiarism include a mark of zero for all labs.

Lab Hints

Study the lab instructions and write your program and/or design your circuit before the start of your first lab session.

Do not wait until the last few days to start the labs. The labs will take longer than expected.

Ken Madore is the staff member in charge of the lab. He is often available in the lab during the day and will provide you with a user ID and a password at the start of the course. He may also be able to help you with problems in the labs if you cannot find of one of the TAs and he is not busy with other duties.

Assignments

An assignment will be given out each Monday and will be due at 9:30 AM Monday morning the following week. Your solutions should be placed in the box labelled "APSC 380" outside the lab (MCLD 112). Solutions will be handed out for all questions but not all questions will be marked. *Late assignments will be given a mark of zero.*

Assignments are to be done individually. Students are encouraged to seek help from classmates but copying is not allowed. Possible penalties for plagiarism include a mark of zero for all assignments.

Text

The text for the course is *Real–Time Microcomputer System Design: An Introduction*, by Peter Laurence and Konrad Mauch, McGraw-Hill, 1987. This book has been used for this course for many years.

Detailed notes will be distributed before the relevant lecture. The notes will often contain exercises or sections to be completed during the lecture.

Please wait until the end of the lecture before taking extra copies. You can always print copies from the course's Web page (see below).

Other References

The C Programming Language second edition, by Brian W. Kernighan and Dennis M. Ritchie, Prentice Hall, 1988, is the standard textbook on C.

The Art of Electronics, second edition, by Paul Horowitz and Winfield Hill, Cambridge University Press, 1989, is a good practical reference book on most aspects of electronics.

Web Page

Students should check the course Web page (`http://www.ee.ubc.ca/~apsc380`) regularly for announcements about the course. These web pages can be read with any browser. Copies of the lecture notes, assignments, exams, and solutions will be available in various formats.

Evaluation

There will be a 50-minute mid-term examination in late February (date TBD) and a final exam in April. The final mark will be calculated as follows:

final exam	45%
midterm exam	25%
labs/reports	20%
assignments	10%

All labs must be completed to pass the course. Late labs and assignments will receive a mark of zero.

Prerequisites

Student should have some experience programming in a procedural language such as C or FORTRAN (e.g. CPSC 152). Students should be able to analyze basic electrical circuits (e.g. ELEC 256).

Intended Audience

Students interested in using (rather than designing) microcomputers for control (rather than computational) applications.

Objectives

By the end of the course the student should be able to:

- identify a control system's inputs and outputs
- design and describe (in tabular and diagram formats) a state machine that implements a given control function
- convert between number systems and apply basic logical and arithmetic operations to numbers
- write a computer program that implements a given algorithm using the subset of C taught in the course
- describe the result of executing a given C program written in the course's subset of C
- describe the function and operation of a microprocessor's address, data and control buses when executing certain basic machine-language instructions
- give the levels appearing on various signal lines during the exchange of data over simple parallel (printer) and serial (RS-232) interfaces
- select an appropriate type of sensor for a given application
- describe the principles of operation of three basic types of A/D converters (flash, successive-approximation and dual-slope)
- draw schematics and compute steady-state voltages, currents and power dissipation of simple BJT, FET, SCR and Triac switching circuits
- select a particular type of electric motor for a given application
- identify possible safety and reliability concerns for a given control application

Detailed objectives will be provided in the introduction to each set of lecture notes.

Course Outline

The following is the approximate order of the topics to be covered:

- microcomputers for control applications
- programming in C
- state machines
- boolean logic, number systems, logic circuits
- microcomputer system architecture
- parallel and serial interfaces
- mid-term exam
- sensors and analog-to-digital converters
- electromechanical actuators and power electronics
- safety and reliability