Course Information

Instructor

Ed Casas. You can contact me by e-mail (edc@ee.ubc.ca) or at my office in MCLD 451 (822-2592), preferably during office hours.

Lectures and Tutorials

Monday, Wednesday and Friday, 9:30 to 10:30 AM in Forward (FORW) 303. Tutorials cover new and important material and attendance is required.

Office Hours

Day/time to be decided (see the course Web page for the latest information).

Teaching Assistants

See the Web page for names and e-mail addresses. The TAs will mark assignments and supervise the labs.

Labs

Mondays 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 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 18	Feb 1
2	Programming a Keypad and Display	Feb 1	Feb 22
3	Washing Machine Controller	Feb 22	Mar 8
4	Microcontroller	Mar 8	Mar 22
5	T.B.D.	Mar 22	Apr 5

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. his report should include a brief description of your program or circuit, source code listings (and possibly 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 (MCLD 112A) 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 about once per week and will be due one week later. 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

There is no text for this course. 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 book *Real–Time Microcomputer System Design: An Introduction*, by Peter Laurence and Konrad Mauch, McGraw-Hill, 1987 was used for this course for many years although much of the material is now outdated.

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 although much of the material is now outdated.

Web Page

Students should check the course Web page:

`http://casas.ee.ubc.ca/380`

will be used to make announcements and to distribute course material (e.g. data sheets). You can also use the Web page to check your marks. Any browser can be used read these pages.

The lecture notes, assignments, labs and solutions will be available from the Web page in PDF format. Free software to view and print PDF documents (Adobe Acrobat) is available for most computers.

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
- 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
- convert between number systems and apply basic logical and arithmetic operations to numbers
- design and describe (in tabular and diagram formats) a state machine that implements a given control function
- 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