Course Outline

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

Wednesdays and Fridays, 8:30 to 9:30 am in MCLD 402. Lectures start January 7 and end April 8. No lectures February 18 or 20 due to mid-term break.

Office Hours

Days/times to be decided.

Tutorials

Mondays 8:30 – 9:30 pm. The tutorials will be used to review difficult lecture material and to solve problems from the assignments. No tutorial January 5 or February 16.

Teaching Assistants

Still TBD. The TAs will alternate in marking the assignments and may run some tutorials.

Web Page

The course Web page (http://www.ee.ubc.ca/~elec379) will be used to make announcements and to distribute some 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 (Ghostview, Adobe Acrobat) is available for most computers.

Intended Audience

Students who will design systems that include digital electronics.

ELEC 379 is a new course, designed for students in the Electrical Engineering rather than the Computer Engineering stream. The course covers the same material as a combination of ELEC 353 (logic design) and ELEC 464 (microcomputer design) but does not cover the material in as much depth.

If you are in the computer engineering option you should probably take ELEC 353 plus ELEC 464 rather than this course. Ask your faculty advisor for more details.

Prerequisites

Student should have experience in the design of simple digital circuits and have done some machine language programming of a microprocessor.

Text

We will not use a textbook in this course. Concepts will be explained in the lecture notes and we will use manufacturers' data sheets and standards documents as examples and reference material. I hope this will give you a better introduction to the design process than using a textbook.

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 Indispensable PC Hardware Book, second edition, by Hans-Peter Messmer (Addison-Wesley, 1995, C$52) is a detailed reference on the IBM PC Architecture.

VHDL for Logic Synthesis: An Introductory Guide for Achieving Design Requirements by Andrew Rushton (McGraw-Hill, 1996, US$55) is a good text on logic synthesis using VHDL. The Synopsys VHDL Compiler Reference Manual (available in the VLSI lab) is also a good reference on synthesis with VHDL. These books cover much more than you will need for this course. A number of tutorials and a short book on VHDL are available on the net (see the Web page).

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.

Assignments and Labs

An assignment or lab will be given out each week. Solutions will be given out for all questions but not all questions will be marked. ¡em¿Late assignments and labs will be given a mark of zero.¡/em¿

This is a new course and lab space and equipment are not yet available. Most of the labs will involve the design and simulation of logic circuits using VHDL synthesis and simulation software available on the department's Sun workstations. Other labs will involve assembly-language programming of the peripheral interfaces on the department's PC's.

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

Evaluation

There will be a one-hour mid-term examination in late October (date TBD). The final mark will be calculated as follows:

final exam	55%
midterm exam	25%
assignments/labs	20%

Objectives

By the end of the course the student should have the background required to begin designing microprocessor-based systems using standard ICs. In general, the student should be able to:

- design simple combinational and sequential circuits using the synthesis subset of VHDL covered in the course
- describe the response of a circuit described in VHDL to a given input
- describe in detail the 80386 processor bus and the behaviour of its signals during read and write cycles
- describe in detail the response of an 80386 processor to an interrupt
- compute timing margins for read and write cycles from CPU and memory timing specifications
- design multi-chip memory banks that meet bus loading and timing requirements using common memory ICs (SRAM, DRAM, EPROM)
- select and justify the choice of I/O strategy (polled, interrupt, or DMA) for a given application
- write software to control programmable peripheral chips (e.g. DMA, interrupt controller, timer/counter, parallel and serial interfaces) in 80x86 assembly language
- describe and analyze the behaviour of SCSI and RS-232 bus signals during common operations

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

Course Outline

The course is structured in a bottom-up order: digital logic circuits, the processor bus, the system bus, and peripheral interfaces. As examples we will use the Xilinx 4000 or Altera 10K FPGAs, the Intel 80386 CPU, the ISA and PCI system buses and RS-232 and SCSI peripheral interfaces.

- review of digital logic design
- logic synthesis with VHDL
- the 80386 microprocessor
- memory system design
- polled, interrupt-driven and DMA interfaces
- system buses (ISA, PCI)
- peripheral buses (Serial, Centronics, SCSI)

Related Courses

This course deals with the design of digital logic circuits, primarily those involving microprocessors. Related topics that are not covered in this course include:

- microprocessor CPU design is covered in ELEC 476.
- IC design is covered in ELEC 479.
- operating systems are covered in CPSC 415 or ELEC 494.