ECE241F: Digital Systems Course Outline

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Goals

- understand basic digital logic circuit design and concepts
- become comfortable with using CAD tools in design
- learn how to design and debug systems

Course Material

- Motivation
  - Advance of Integrated Circuit technology is and will continue to provide enormous opportunities based on digital logic
- Combinational Logic
  - how to build logic gates from transistors
  - AND, OR, NOT, EXOR gates
  - Sum of Products representation - simple synthesis of logic
  - how to make a simple binary adder
- Timing of Logic
  - how to calculate the performance of digital logic & hazards
- Sequential Logic
  - how circuits with memory are built
- Optimization - 2-level, multi-level including Optimization Metrics
  - methods for making the implementation of a logic function better in cost and speed
- Multiplexors, Decoders
  - using multiplexors & decoders to do serial communication
  - using multiplexors to perform logic functions
- Word Problems
- Counters
  - techniques for high-speed and special kinds of counting in hardware
- Design process and debugging
  - practices to ensure correct and efficient design and testing of designs

- Input/Output with LEDs/Switches,
- Programmable Logic, PLAs, ROMS for Logic
- The ABEL Hardware Description Language
- Finite State Machines
- Random Access Memory (RAM)
- Tristate Busses, Open Collector Busses
- Field-Programmable Gate Arrays (FPGAs)
- Number Systems
- Advanced Arithmetic: Fast Addition/Subtraction & Combinational Multiplier
- Asynchronous Circuits (if time)

Text and Software

The textbook is *Contemporary Logic Design* by Randy H. Katz, Benjamin/Cummings, 1994. The software is called *LogicWorks 3* by Capilano Computing Systems, Ltd., which runs on MACs and PCs under Windows. The text and the software are both required.

Note that older versions of LogicWorks are okay for this course, but all references to the manual will be for the LogicWorks 3 manual. You can get more info about LogicWorks 3[1] on the web.

A software update that fixes bugs related to the Windows 3.1 and Windows95 can be downloaded directly from here[2]. To install this upgrade, following these README instructions[3].

Several options *should* be available to you for purchase (prices have not been confirmed) at the University of Toronto Bookstore:

Option	Cost
Text	$ 89.65
Text + MAC software	$146.20
Text + Windows software	$146.20
MAC software only	$ 73.05
Windows software only	$ 73.05

Computer System Requirements

Windows	
Processor	386 or better (486 recommended)
Disk	4.5 MB, 1.44MB 3.5″ floppy
Memory	8 MB RAM
Video	VGA or better
Version	Windows 3.1 or Windows for Work Groups™ 3.11 running 386 Enhanced mode. Mouse required
Macintosh	
Model	All current Macintosh models, including the Macintosh Classic™ Series, II™ Series, and Quadra™ Series
Disk	3 MB, 1.44 MB disk drive
Memory	4 MB RAM
System	6.0.7 or better

[1] http://heg-school.aw.com/cseng/authors/capilano/lw3/lw3.html
[2] ftp:../logicworks/LW302UPD.EXE
[3] ftp:../logicworks/README.lw3.txt