Computer Structure & Introduction to Digital Computers

Spring 2003 Plan

Classes

chapter	hours	topic
Digital Abstraction	2	analog signals, digital signals, noise, static transfer functions
Foundations of Combinational Circuits	3	Boolean functions, gates, combinational circuits - syntax and functionality, simulation theorem, cost, propagation delay
Combinational Modules	5	notation, trees of associative gates (cost, delay, and lower bounds), half-decoder, decoder, encoder, multiplexer, shifter, priority encoder
Arithmetic Modules	5	adders (ripple-carry adder, conditional sum adder, compound adder), parallel adder (parallel prefix computation), two's complement representation, signed addition, reduction of signed addition to unsigned addition, detection of overflow and negative result.
Foundations of Synchronous Circuits	3	clock signal, characteristics of flip-flops (setup time, hold time, contamination delay, propagation delay), reduction of an "ideal" flip-flop to an arbiter, impossibility of arbiter, memory (RAM & ROM)
Analysis and Synthesis of Synchronous Circuits	3	synchronous circuits - syntax and functionality, timing constraints, minimum feasible clock period, clock skew
Finite State Machines	2	finite automata, synchronous circuits as implementations of finite automata, synthesis
Buses and Bus Protocols	3	master, slave, bus transaction, simple bus protocol
A Simple Microprocessor	5	instruction set architecture, datapath, control
Introduction to Interrupts	2	operating systems, interrupts, precise interrupt handling
DLX with Interrupt Handling	3	hardware & software support, detailed description of interrupt handling
Correctness of Interrupt Handling	3	specification, correctness proof

Exercises

1. Boolean algebra: Boolean algebra, switching algebra, duality, more theorems, other examples of Boolean algebra, DNF and CNF. (Appendix in book by Ercegovac, Lang, and Moreno)

2.

3.