# COS116: Computational Universe      Spring 2006

Tentative Course Plan

| Week | Lecture Topic | Lab topic |
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| 1 | Intro: Computer science, a new way of looking at the world. (CS ≠ Programming!) <br><br> Telling a robot how to behave. | Creating and understanding a weblog. (To be used in later assignments.) |
| 2 | Telling a computer how to behave. (Via pseudocode). <br><br> "Everything's a number." (Simulation. Creating new worlds. Games and Life.) | Understanding a simple robot and the determinants of its behavior. (Each student gets a robot for the rest of the semester.) |
| 3 | "It ain't no good if it ain't snappy enough." (Efficiency in computations.) <br><br> "It sure is clever, but can it swing?" (Computer music.) | Modifying the robot's behavior. |
| 4 | How the computer raises its IQ. ("Intelligent" programs and how they view the world.) <br><br> What is a computation? Can we make a fundamentally different computer? | Computer Music. |
| 5 | What computers just cannot do. <br><br> The fluid boundary between program and data. Implications for computational technologies. <br><br> Bioinformatics. The parallels between molecular basis of life and the computer. How computers enable the study of life. | Robotic fine art (drawing, painting, music, dance, or maybe something else?) |
| 6 | Logic: How the Greeks and medieval philosophers tried to formalize thought. <br><br> Boolean logic and Boolean circuits: the basis of computational hardware. | *No lab session.* Instead, students write an analytical article on their blogs. |
| 7 | How a Boolean circuit (and the computer) acquires memory: the importance of feedback. <br><br> Clocked circuits and finite state machines. | Understanding properties of elementary gates and circuits. |
| 8 | How to juggle the various demands of life. (Multitasking and operating systems.) | Understanding finite state machines. |

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| | What do computers talk about when they talk? (Networking and the internet.) | |
| 9 | Physics of the silicon chip. | Strategies for congestion control on the internet. |
| | What can computers not do efficiently? And is that good or bad? | |
| 10 | Secrets and Lies, Knowledge and Trust. (Modern cryptography.) | More about congestion control. Fairness, quality of service, etc. Network phenomena. |
| | Viruses, worms, zombies, and other beasties. | |
| 11 | How do search engines work? | Study of Virus propagation in networks. Implications for epidemiology. |
| | What is intelligence? (What is your computer's Turing Quotient?) | |
| 12 | Can computers think? | Dissecting a computer. |
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## Some memorable quotes:

This `telephone' has too many shortcomings to be seriously considered as a means of communication. The device is inherently of no value to us.
-- Western Union internal memo, 1876

I think there is a world market for maybe five computers.
-- Thomas Watson, chairman of IBM, 1943

Computers in the future may weigh no more than 1.5 tons.
-- Popular Mechanics, forecasting the relentless march of science, 1949

I have traveled the length and breadth of this country and talked with the best people, and I can assure you that data processing is a fad that won't last out the year.
-- The editor in charge of business books for Prentice Hall, 1957

But what ... is it good for?
-- Engineer at the Advanced Computing Systems Division of IBM,1968, commenting on the microchip

There is no reason anyone would want a computer in their home.
-- Ken Olson, president, chairman and founder of Digital Equipment Corp., 1977

There has been a great deal said about a 3,000-mile high-angle rocket. In my opinion, such a thing is impossible today and will be impossible for many years [...]
-- Vannevar Bush, author of *As We May Think*, Director of the Office of Scientific Research and Development, as stated before the Special Senate Committee on Atomic Energy [http://www.hq.nasa.gov/office/pao/History/SP-4404/ch3-7.htm, http://www.hq.nasa.gov/office/pao/History/SP-4201/ch1-4.htm]