

CS 107: Computational Systems

New Course Fall 2004 - carries Math & Computer Science Divisional Studies credit

Instructor: Professor Mark Crovella

Day and Time: TR 2 - 3:30

Synopsis

- ? What is computing? Where can it take place? Does computing occur in natural systems like the cell and the brain?
- ? Why do both cells and PCs become infected by viruses?
- ? How can we recognize computation in settings as different as a PC and a cell?
- ? Are there common principles that lie behind computation in both systems, or even in *all* computational systems? Are there limits to what can be computed in all such systems?

By the end of the CS 107, you will have a sound understanding of the answers to all of these questions.

CS 107 is centered on the idea that computation is a general phenomenon that occurs in many places and settings. CS 107 presents a modern view of information and computation, and examines how computation takes place in electronic computers, DNA, neurons, and even subatomic particles.

Overview

The course starts with a historical review of how the ideas of information and computation developed. It then looks at underlying principles of all computation: the necessary elements of a computing system; the essential equivalence of all computing systems; the existence of problems that cannot be solved by any computer; and the existence of other problems that appear to be unsolvable from a practical standpoint.



Armed with this foundation, the course then looks at four examples of computational systems: cells, subatomic particles, brains, and electronic computers. In each case, the course looks at how information is represented and how computation takes place. This allows us to interpret many aspects of the natural world from a computational standpoint, and see the common thread of computing that underlies evolution, quantum physics, personal computers, and even psychology.

Along the way, the course will look at problems that typically occur in computational systems: in particular, the existence of viruses in the cell and the electronic computer. We will look at how viruses arise and how they can be prevented.



Readings and Grading

Readings for the course are nontechnical. Most readings are accessible accounts of natural systems from a computational perspective. No computer programming is required. Grading is based on midterm and final (70%) and homeworks (30%).

More Information

Course details will appear on the course web page: www.cs.bu.edu/faculty/crovella/courses/CS107
Other questions? Contact Prof. Crovella at crovella@cs.bu.edu