

New Spring 2009 Course Open to All Majors

ENEE159V Introduction to Parallel Algorithmic Thinking and Its Desktop Computing Context (3 Credits). CORE Interdisciplinary & Emerging Issues (IE) Course.

Th 3:30pm-6:00pm, CSI 1121, Prof. Uzi Vishkin, Electrical and Computer Engineering

Introduction Commodity computers are undergoing a fundamental change, unprecedented since the advent of computers in the 1940s. In the first chapter of computer history that spanned from 1946 through 2003, clock frequency had been improving at a stunning exponential rate. As of 2004, clock frequency is hardly improving and is not expected to improve much due to implementation issues, such as power consumption. However, the number of transistors on a single chip keeps increasing at an exponential rate as before and is expected to reach tens of billions by the time you graduate, up from tens of thousands 30 years earlier. The 2007 fourth edition of *Computer Architecture: a Quantitative Approach*, by J. Hennessy and D. Patterson—perhaps the single most popular computer engineering textbook--summarizes the situation as follows: "...this fork in computer architecture means that for the first time in history, no one is building a much faster serial processor. If you want your program to run significantly faster ... you're going to have to parallelize your program."

Course Description and Objectives In 2004, standard (desktop) computers comprised one processor core. In 2008, some have [8 cores](#). In 4 more years, 64-core computers (another factor of 8) are expected. Transition from serial computing to parallel computing mandates the reinvention of the very heart of computer science and engineering (CSE). These highly parallel computers need to be built and programmed in a new way. The change will affect the undergraduate programs in computer science, computer engineering, electrical engineering and beyond in such a profound way that would overhaul the very introduction of the field to freshmen. This reinvention of computing for parallelism will define the overriding scope of the course. The main intellectual component of the course will be an introduction to the theory of parallel algorithms to general Engineering, Mathematics and Science students. The course will highlight parallel algorithmic thinking for obtaining good speed-ups with respect to serial algorithms. Students will acquire hands-on experience by programming a new 64-processor computer built by Dr. Vishkin's research team at UMD. For a 2007 UMD press release on that computer, please look up:

http://www.eng.umd.edu/media/pressreleases/pr062607_supercomputer.html

Syllabus <http://www.umiacs.umd.edu/users/vishkin/TEACHING/ENEE159V-S09Syllabus.pdf>

Prerequisite *Students who do not major in computer science, or computer engineering are also welcome to take this course.* Basic experience with a programming language such as C or Java is needed. No other background is required, but the course is not recommended for students who are intimidated by basic mathematical concepts.

Grading Method

Participation and contribution to class discussion 15%

Essay 25%

Programming assignments 60%

Honors Version ENEE159H is an "H" version of this course.