Vijay K. Garg Fall 2018
EE 382C/EE 361C: Multicore Computing

TTh 2:00 - 3:30, EER 1.516

Instructor: Prof. Vijay K. Garg ; **Office**: EER 7.884
Phone: (512) 471-9424 ; **email**: garg@ece.utexas.edu; **Office Hours**: T Th 11:00-12:00 ; or by appointment

Class Meeting Time and Room Number: TTh 2:00 - 3:30, EER 1.516

Unique Number for EE 361C : 16675
Unique Number for EE 382C : 16900

Prerequisites for EE 361C : Upper-division standing.
Prerequisites for EE 382C : Graduate standing or permission from the instructor.

Course Contents: There has been a radical shift in computers in recent years. Almost all computers are now multicore. Since the speed of individual sequential processor is not increasing, the only way to improve performance for applications is to harness the multiple cores. In this course we will look at the challenges and techniques in programming these systems. The course will expose students to theoretical as well as practical aspects of designing multicore software systems. It assumes that the student has undergraduate level knowledge of programming, data structures, operating systems, computer architecture, and algorithms. Following topics will be covered in the course:

- *Languages:* concurrent languages, inter-process communication, openMP, Java Streams
- *Consistency condition for concurrent objects:* Sequential consistency, Linearizability
- *Synchronization:* Lock-free synchronization, Wait free synchronization, consensus number, software transactional memory
- *Parallel Basic Algorithms:* Reduce, Parallel Prefix Scan, Pointer Jumping, Partitioning, Cascading
- *Parallel Sorting Algorithms:* Odd-Even Sort, Bitonic Sort, Parallel Mergesort
- *Parallel Graph Algorithms:* Lattice Linear Predicates, Shortest Path Algorithms, Weighted Matching
- *Concurrent Data Structures:* Concurrent stacks, queues, linked lists, hashing, skiplists
- *CUDA:* Implementing Parallel Algorithms on GPU using CUDA
- *Mechanical Analysis of systems:* Temporal Logic, Modal checking, reachability analysis, Using SPIN

Grading: 35 % Assignments, 20 % Exam 1 (in class), 25 % Term project, 20 % Exam 2 (in class)
There is no final exam in this course. Instead, students are required to do a term project. Students in EE 382C have to submit a term paper based on their project and give a class presentation. Students in EE 361C would be required to give a demo of their project to the class. Students in EE 382C are also required to scribe lecture notes for one lecture.

Course Material: Lecture notes by the instructor supplemented with papers from various conferences and journals. Optional Book: The Art of Multiprocessor Programming, by Herlihy and Shavit, Morgan-Kaufmann Elsevier 2012.

Slides for the book

Course Website: We will use Canvas System available at http://courses.utexas.edu

Add/Drop Policy: Adds and drops for graduate students taking graduate courses are not approved after the twelvth class day except for good cause. Applications for approval to drop a course after the twelveth class day should be made in the Graduate ECE Office.

Honor Code: The core values of the University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the University is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community.

Pending Absence: By UT Austin policy, you must notify me of your pending absence at least fourteen days prior to the date of observance of a religious holy day. If you must miss a class, an examination, a work assignment, or a project in order to observe a religious holy day, you will be given an opportunity to complete the missed work within a reasonable time after the absence.

Students with Disabilities: The University of Texas at Austin provides upon request appropriate academic adjustments for qualified students with disabilities. For more information, contact the Office of the Dean of Students at 471-6259, 471-4241 TDD or the College of Engineering Director of Students with Disbailities at 471-4382.

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vijay garg 2016-04-25