

Syllabus: Parallel Computing

For the 2011-2012 School Year

Contact Information

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Fall Semester

Students study parallel programming and visualization in a variety of contexts with an emphasis on industry-standard tools. Topics include Huffman compression, projectile motion with air resistance, parameter search, fractal generation, Brownian motion and diffusion, cellular automata, and the heat equation. Most problems are of the so-called “embarrassingly parallel” type. The programming language is C using both MPI and 2-D OpenGL.

Spring Semester

Students study parallel programming and visualization in a variety of contexts with an emphasis on underlying and experimental technologies. Topics include JPEG compression, orbital mechanics and the N-Body problem, iterative matrix solvers, and graphics rendering via ray tracing. The programming language is C using both MPI and 3-D OpenGL. Additional tools and environments include XMT-C, pthreads, OpenMP, sockets, and Nvidia’s CUDA for GPGPU.

Grading

Both courses are weighted as an honors course; this means that each semester an additional 0.25 quality point will be added to the quality-point value assigned to the final grade. This happens after the quality-point value is divided by two, since they’re semester courses. For the whole year, then, the semester values are added and: $0.25 + 0.25 = 0.5$

Each semester grade will be determined as follows:

Grade Event	Points	Quantity	Total
Quarter Grade Final Percentage Earned	100	2	200
Class Participation Appropriate Behavior	20	1	20
TOTAL SEMESTER POINTS	–	–	220

There is no final exam. The class participation grade will appear on your report card as the final exam grade for the semester and is earned over both quarters. On the last day of each quarter there will be an in-class culminating activity.

Each quarter grade will be determined as follows:

Grade Event	Points	Quantity	Total
Program Turn-In Lab Write-Up	10	5	50
In-Class Closed Book Quiz	10	5	50
Last-Day Culminating Activity	5	1	5
TOTAL QUARTER POINTS	–	–	105

The current FCPS grading scale:

Letter Grade	Quality Points	Half-Open Percentage Intervals	
		\geq	$<$
A	4.0	92.5	100+ ϵ
A-	3.7	89.5	92.5
B+	3.3	86.5	89.5
B	3.0	82.5	86.5
B-	2.7	79.5	82.5
C+	2.3	76.5	79.5
C	2.0	72.5	76.5
C-	1.7	69.5	72.5
D+	1.3	66.5	69.5
D	1.0	64.0	66.5
F	0.0	0.0	64.0

There is no extra credit.

All quiz topics are unannounced and there is no formal review session prior to a quiz.

In the case of unplanned absences, students should make arrangements for any necessary makeup immediately upon return to school. For each class absence, students have one class session for makeup. No extension is provided for new work assigned after the student has already returned to school. For an approved prearranged absence, it is the student's responsibility to make arrangements in advance of the absence.

For program turn-in lab write-ups a paper copy must be submitted by the time buses leave. No email. The location for submissions will be clearly indicated and if all else fails use the mailboxes in the main office. There is a grace period of two school days following all due dates except at the end of the quarter. After the grace period ends, late work may be turned in by the end of the next school day (even if our class does not meet that day) with a penalty of one point, or on subsequent days with a cumulative penalty of one point per calendar day. The total penalty will not exceed five points but all assignments must be turned in by 8 AM on the first teacher workday after the quarter to receive any credit.

Programming Language

The programming language is C. No prior experience is assumed. Software for home-use is available for free at a variety of websites which are linked from the course website.

Textbook

The textbook is Lin and Snyder, Principles of Parallel Programming. The ISBN is 0-321-48790-7 and the cost is eighty-five dollars. Students may check out a book if they like. Together the two courses cover parts of chapters one through seven and nine through eleven of the text, and supplemental material as needed.

Website

All course materials are posted at www.tjhsst.edu/compsci/parallel and no login is required.

Lab Hours

The lab is generally open before school, during lunch, and eighth period. You can also connect to remote.tjhsst.edu using ssh or PuTTY, and transfer files using sftp or WinSCP.

Fire Drills

Exit via the back door of the lab. This leads directly to the outside. Bear left towards the fenceline on the side of the school to avoid the people coming out of the trailers.

Crisis Situations

“Secure the Building”: neighborhood incident, students in rooms with doors locked.

“Lockdown”: threat on property, students on floor with lights out and blinds pulled.

Computer Ethics

All students are expected to comply with the Fairfax County Network User Guidelines and an easy way to do this is to be engaged exclusively on work for this class at all times.

Other Guidelines

All students are expected to adhere to the TJ Honor Code and the FCPS Dress Code. This class encourages collaboration and sharing which means talking together about a lab assignment. Plagiarism is copying another person’s work and presenting it as your own.

Repeated or one-time grossly unacceptable behavior will be reported to the guidance department, the administration, and your parents.

Schedule

September	Scaling Up the Grid Size
October	Parameter Search
November	Spatial Decomposition
December	Nearest Neighbor Coupling
January	Optimized Communication
February	Fine-Grain Parallelism
March	Shared Memory Model
April	All Pairs Coupling
May	Graphics Card Programming
June	Ubiquitous Applications