COURSE OUTLINE — subject to changes :

0. introduction

L-1	Mon 26 Aug	welcome to mcs 572 – supercomputing – measuring performance
L-2	Wed 28 Aug	scalability – types of parallel computing
L-3	Fri 30 Aug	high level parallel processing
	Mon 2 Sep	**Labor Day holiday. No classes.**

1. distributed memory parallel computing

L-4	Wed 4 Sep	basics of Message Passing (MPI) – broadcasting data
L-5	Fri 6 Sep	using MPI to write parallel programs
L-6	Mon 9 Sep	pleasingly parallel programs – Monte Carlo simulations
L-7	Wed 11 Sep	static and dynamic task assignments – load balancing
L-8	Fri 13 Sep	hands on supercomputing
L-9	Mon 16 Sep	partitioning and divide-and-conquer strategies

2. shared memory parallel computing

L-10	Wed 18 Sep	shared memory parallelism – an introduction to OpenMP
L-11	Fri 20 Sep	the work crew model with Julia, OpenMP, and pthreads
L-12	Mon 23 Sep	tasking with OpenMP – Bernstein's conditions – task dependence
L-13	Wed 25 Sep	tasking with Julia – parallel recursive functions
L-14	Fri 27 Sep	evaluating performance – metrics, task graph, isoefficiency, roofline
L-15	Mon 30 Sep	work stealing – threading building blocks

3. acceleration with Graphics Processing Units

L-16	Wed 2 Oct	a massively parallel processor: the GPU
L-17	Fri 4 Oct	programming GPUs with PyCUDA and with Julia
L-18	Mon 7 Oct	introduction to CUDA
L-19	Wed 9 Oct	data parallelism and matrix multiplication
L-20	Fri 11 Oct	device memories and matrix-matrix multiplication
L-21	Mon 14 Oct	thread organization and matrix multiplication
L-22	Wed 16 Oct	warps and reduction algorithms
L-23	Fri 18 Oct	review of the first 22 lectures
L-24	Mon 21 Oct	**midterm exam**

4. pipelining and synchronized computations

L-25	Wed 23 Oct	pipelining to create parallel algorithms
L-26	Fri 25 Oct	applying pipelining to sorting
L-27	Mon 28 Oct	solving triangular linear systems with a pipeline
L-28	Wed 30 Oct	synchronization with linear, tree, and butterfly barriers
L-29	Fri 1 Nov	parallel iterative methods to solve linear systems
L-30	Mon 4 Nov	heat distribution – domain decomposition methods
L-31	Wed 6 Nov	memory coalescing techniques
L-32	Fri 8 Nov	tensor cores
L-33	Mon 11 Nov	performance considerations

5. applications

L-34	Wed 13 Nov	parallel FFT and sorting
L-35	Fri 15 Nov	parallel Gaussian elimination
L-36	Mon 18 Nov	GPU accelerated QR
L-37	Wed 20 Nov	Case Study: Advanced MRI Reconstruction
L-38	Fri 22 Nov	multiple double arithmetic on the GPU
L-39	Mon 25 Nov	GPU accelerated Newton's method for Taylor series
	Wed 27 Nov	**Student Wellness Day. No classes.**
	Fri 29 Nov	**Thanksgiving holiday. No classes.**

6. review and/or final project presentations

L-40	Mon 2 Dec	final review and/or project presentations
L-41	Wed 4 Dec	final review and/or project presentations
L-42	Fri 6 Dec	final review and/or project presentations